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B' Hampden. C.

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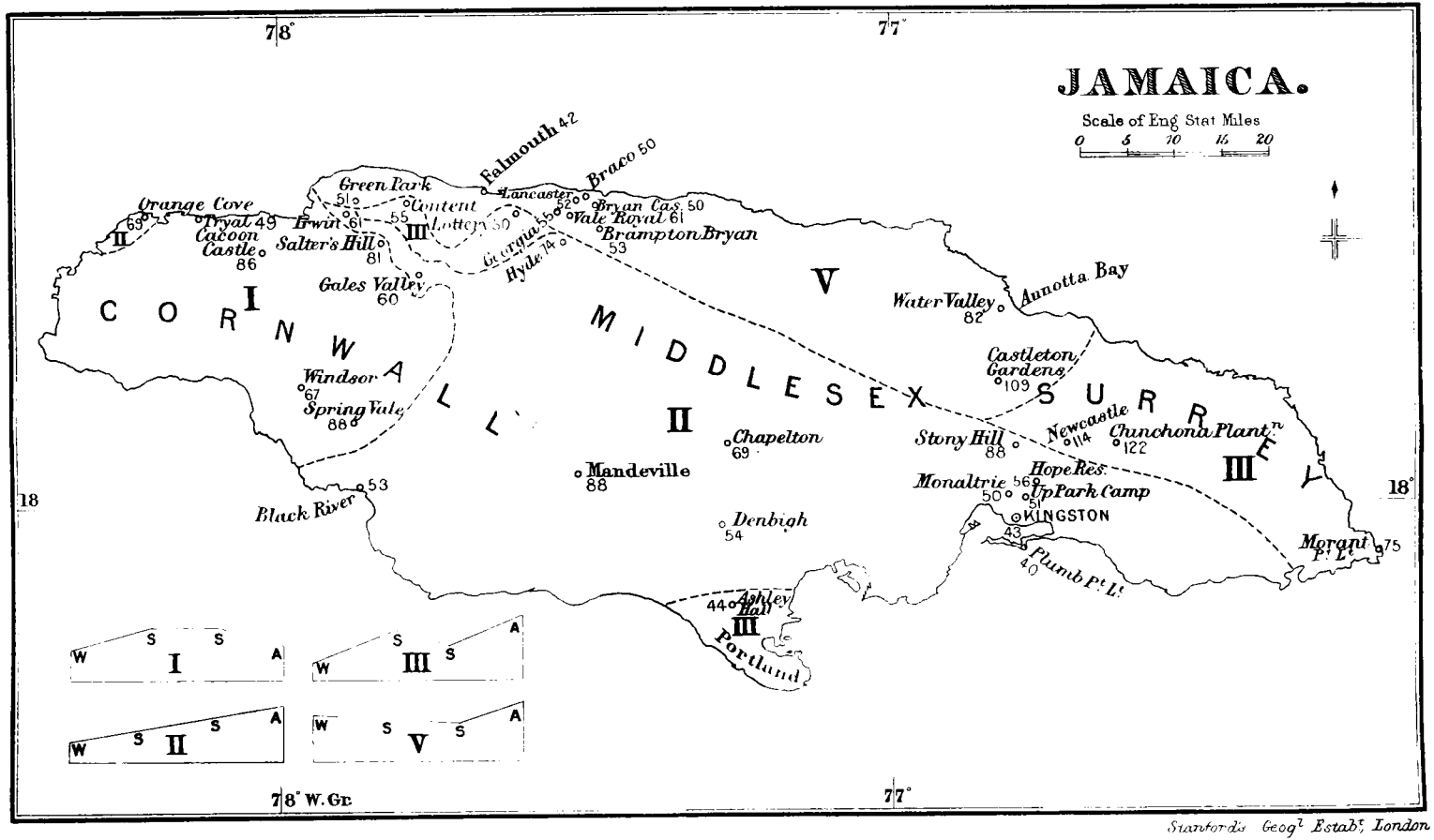
78°
77°
JAMAICA.
Scale of Eng Stat Miles
0 5 10 15 20
Falmouth 42
Braco 50
Green Park
Content
Lancaster
Bryan Cas. 50
Vale Royal 61
Brampton Bryan
53
Orange Cove
69
Tryal 49
Caboon Castle
86
Ewrit 61
Salter's Hill
81
Lottery 50
Georgia 55
Hyde 74
Gales Valley
60
II
III
I
C O R N W A L L
V
M I D D L E S E X
S U R R E Y
II
III
Water Valley
82
Annotta Bay
Castleton Gardens
109
Windsor
67
Spring Vale
88
Chapelton
69
Mandeville
88
Stony Hill
88
Newcastle
114
Cinchona Plant.n
122
Hope Res.
Monaltrie 56
50
Up Park Camp
51
KINGSTON
43
Morant Pt. L.
75
Plumb Pt. L.
40
18°
18
Black River
53
Denbigh
54
Ashley Hall
44
III
Portland
W S S A
I
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II
V
78° W. Gr.
77°
Stanford's Geog.l Estab.t London

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXIX.] FEBRUARY, 1885. [PRICE FOURPENCE, *or 5s. per ann. post free.*

DISTRIBUTION OF RAIN IN JAMAICA DURING THE DECADE 1871-80.

BY PROF. V. RAULIN, *of Bordeaux.*

JAMAICA is formed by a mountain chain running nearly E. and W., commencing on the east with the Blue Mountains, which rise to 7,277 feet, and ending with the Dolphin Head towards the west, which is itself 3,445 feet in altitude. Long slopes and plains reach from the mountains to the northern and southern coasts. During the period 1871-80, there were 55 stations at which observations were made during from 4 to 10 years; at 8 others the periods extend to from 11 to 18 years, and at the two military hospitals at Up Park Camp and at Newcastle, they reach to 22 and 28 years respectively.

The seasonal distribution of rainfall in Jamaica is nearly as varied as that of Southern France.

Régime I. is found only in the western part of the island, W. of a line drawn from Falmouth to Black River Bay.

Régime II. forms to the S. of Falmouth a narrow zone, which S.E. of Hyde expands over the whole southern part, from Black River Bay to beyond Kingston. It is also found at the N.W. extremity of the island.

Régime III. forms a narrow zone at a short distance round Falmouth, prevails on the east of the island from Newcastle to Morant Point, and re-appears on the south side at the base of the Portland peninsula.

Régime V. prevails along the N. shore from Falmouth to Annotta Bay.

We have thus (with the exception of some isolated stations) *Régime* I. in the west of the island, *Régime* II. in the south (with an extension to N.), *Régime* III. in the east, and *Régime* V. along the N.

In the eastern part of Cornwall, *Régimes* I., II., III. and V. follow in succession from S.W. to N.E. between Windsor and Falmouth, just as they do in southern France from Clermont-Ferrand, past Limoges to la Rochelle.

RAINFALL IN JAMAICA.

Stations.	Height ft.	Years.	Winter in.	Spring in.	Summ'r in,	Aut'mn in.	Year. in.
RÉGIME I. (as at Moulins).—*Dry Winter and Wet Summer.*							
56. Tryall	120	1876–79 (4)	5·44	8·65	19·60	15·16	48·85
9. Caccon Castle	900	1873–79 (7)	13·27	20·19	29·12	23·32	85·90
8. Burnt Ground	800	1873–79 (7)	9·49	24·96	33·24	26·50	94·19
16. Copse	740	1873–79 (6¾)	10·54	21·78	30·21	29·34	91·87
11. Catherine Mount	180	1873–79 (7)	12·73	13·19	19·75	17·93	63·60
50. Salter's Hill	889	1868–79 (11⅓)	14·66	19·47	23·69	23·32	81·14
37. Latium	447	1874–79 (6)	12·61	16·05	22·08	20·60	71·34
51. Spring Vale	500	1872–79 (7⅔)	14 36	20·27	30·34	23·37	88·34
61. Windsor	20	1865–79 (14⅓)	6·75	19·06	21·44	19·87	67·12
29. Hampstead	600	1857–62 (5¾)	7·90	17·28	17·50	15·57	58·25
RÉGIME II. (as at Lyon).—*Gradual increase from Winter to Autumn.*							
44. Orange Cove	20	1872–79 (7½)	10·51	14·44	21·79	22·09	68·83
34. Irwin	400	1870–79 (9½)	10·63	14·13	15·73	20·80	61·29
23. Gales Valley	300	1875–79 (5)	12·04	12·57	17·84	17·89	60·34
33. Hyde	700	1870–79 (9½)	16·41	17·76	18·15	22·14	74·46
26. Golden Grove	?	1875–79 (4)	12·83	15·93	16·99	19·27	65·02
3. Black River	4	1870–79 (9)	5·89	12·49	15·05	19·82	53·25
22. Fullerswood Park	25	1874–79 (6)	5·28	12·24	12·75	18·65	48·92
39. Mandeville	2130	1870–79 (9½)	9·68	21·50	23·14	33·82	88·14
40. Marshall's Pin	2000	1876–79 (4)	10·86	23·61	26·20	26·94	87·61
60. Whitney	?	1875–79 (5)	8·12	21·72	29·20	30·94	89·98
47. Pennants	718	1876–79 (4)	7·44	20·66	25·82	28·13	82·05
13. Chapelton	1000	1870–79 (6¾)	8·34	14·90	19·57	25·83	68·64
17. Denbigh	198	1862–79 (17½)	5·39	13·46	14·71	20·14	53·70
28. Halse Hall	258	1874–79 (5½)	6·00	18·46	19·73	23·21	67·40
20. Ewing's Caymanas	50	1871–79 (9)	6·06	11·82	13·45	21·16	52·49
53. Stony Hill	1425	1870–79 (5¾)	11·18	19·29	23·47	34·51	88·45
41. Monaltrie	250	1872–79 (8)	5·14	8·00	12·62	24·55	50·31
... Up Park Camp	225	1872–80 (8)	9·36	10·94	12·38	17·98	50·66
31. The Hope Reservoir	650	1871–79 (8)	7·07	10·89	15·65	22·38	55·99
35. Kingston	60	1870–79 (9)	5·13	7·48	11·36	19·21	43·18
46. Palisadoes Plantation	?	1876–79 (4)	4·85	9·33	18·76	19·00	51·94
48. Plumb Point Light	9	1870–79 (9¾)	3·77	6·71	11·28	17·76	39·52
RÉGIME III. (as at Mende). — *Winter and Summer dry, Autumn very wet.*							
15. Content	770	1872–79 (8)	13·59	14·39	11·85	15·63	55·46
55. Tilston	?	1875–79 (4½)	12·59	15·92	14·72	15·99	59·22
38. Lottery	700	1870–79 (10)	12·03	12·51	9·75	15·82	50·11
25. Gibraltar	700	1870–77 (7⅓)	12·15	13·52	12·38	19·62	57·67
57. Unity Valley	1170	1875–79 (5)	20·71	21·34	20·94	23·06	86·05
12. Cave Valley	1800	1871–79 (9)	8·36	20·99	19·59	23·03	71·97
... Newcastle	3800	1871–80 (8⅓)	20·92	24·83	24·02	44·44	114·21
14. Cinchona Plantation	4850	1871–79 (9)	26·99	27·89	19·29	47·45	121·62
42. Morant Point Light	12	1870–79 (9⅔)	15·04	15·30	15·18	29·76	75·28
2. Ashley Hall	75	1871–75 (5)	4·30	10·35	8·23	20·96	43·84
RÉGIME V. (as at Limoges).—*Winter & Autumn very wet, Spring & Summer rather dry.*							
49. Running Gut	50	1871–79 (9)	10·92	9·26	5·76	14·24	40·18
54. Success	20	1871–79 (9)	10·21	9·82	6·15	14·01	40·19
45. Orange Valley	300	1875–79 (5)	14·35	11·18	9·21	13·28	48·02
27. Green Park	?	1869–79 (10½)	12·63	12·35	8·87	16·78	50·63
19. Dundee	500	1875–79 (5)	14·34	11·77	12·53	17·23	55·87

RÉGIME V.—*(continued.)*

Stations.	Height. ft.	Years.	Winter. in.	Spring. in.	Summ'r. in.	Aut'mn. in.	Year. in.
21. Falmouth	10	1870–79 (9)	10·65	10·34	6·50	14·29	41·78
36. Lancaster	100	1870–79 (10)	15·01	11·56	8·83	16·72	52·12
24. Georgia	700	1870–79 (10)	15·96	12·60	10·50	15·47	54·53
58. Vale Royal	900	1870–79 (10)	17·41	13·55	12·31	17·94	61·21
4. Braco	90	1870–79 (10)	14·42	11·22	8·66	15·49	49·79
7. Bryan Castle	850	1870–79 (9½)	14·86	11·31	8·48	15·83	50·48
6. Brampton Bryan	900	1870–79 (9½)	14·20	12·09	10·66	16·05	53·00
32. Hopewell	900	1872–79 (8)	19·18	13·82	13·28	19·16	65·44
52. Steelfield	700	1870–79 (9½)	14·79	12·42	11·60	16·23	55·04
30. Harmony Hall	?	1870–79 (10)	14·00	9·37	6·35	15·21	44·93
18. Drax Hall	50	1870–79 (10)	20·39	14·21	9·98	22·57	67·15
5. Bradfield	1650	1865–79 (14½)	23·72	19·19	14·19	27·02	84·12
1. Albion	2000	1865–79 (14½)	17·52	16·99	15·56	23·97	74·04
43. New Ramble	700	1875–79 (5)	22·51	18·40	13·57	24·65	79·13
59. Water Valley	100	1875–79 (5)	24·65	17·70	13·55	25·79	81·69
10. Castleton Gardens	700	1871–79 (8)	24·97	23·15	26·04	34·39	108·55

The prefixed reference numbers are those assigned to the respective stations in Mr. Maxwell Hall's official tables, "Jamaica Rainfall from about 1870 to 1879," published in the *Jamaica Gazette.*

ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday evening, January 21st, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. The Secretary read the report of the Council, which showed the Society to be in a very satisfactory condition. The Council equipped a typical climatological station in the grounds of the International Health Exhibition, in order that persons desirous of organizing a station might see one arranged in accordance with the regulations of the Society. A Conference on Meteorology in relation to Health was arranged for by the Society, and held at the Health Exhibition on July 17th and 18th. The Council have appointed committees to investigate the subjects of the brilliant sunrises and sunsets of 1883-4, and of the local phenomenon known as the Helm Wind of Cross Fell, Cumberland. The observing stations of the Society now number 85, the results from which are printed in the *Meteorological Record.* The whole of the stations in the south of England have been inspected during the year, and found to be generally in a satisfactory state. The number of Fellows on the roll of the Society is 552, of whom 37 were elected in 1884.

The President, Mr. R. H. Scott, then delivered his address, in which he reviewed the distribution of meteorological observatories, and exhibited a large map, showing all the observing stations over the globe, and also the distribution of information as to ocean meteorology existing in the Meteorological Office. He said that there were now six Meteorological Societies publishing journals, and in addition six periodicals almost exclusively devoted to the science. He went on to say, "With all this wealth of literature

there is one particular in which, in this country at least, our science labours under a great disadvantage. As far as I am aware, no instruction is given in it, except at the Royal Naval College, Greenwich. In Germany, in the current half year, no less than eleven courses of lectures are announced at as many Universities or High Schools." Mr. Scott then proceeded to treat of the general state of the science of meteorology over the globe, as compared with the programme sketched out by Prof. James Forbes in the Report of the British Association, 1840, and considered the different kinds of observations proposed by Prof. Forbes for various classes of stations and the degree to which his suggestions had been carried out. The next subject was the attempts which have been made by balloon ascents, mountain stations, &c., to gain a knowledge of the condition of the upper atmosphere, and Mr. Scott stated that on enquiry from the various foreign institutions which possessed affiliated mountain stations he had found that except in the case of Mount Washington, none of the observations were practically much used in forecasting. No telegrams are received from Pike's Peak. In one particular all authorities are agreed that, owing mainly to the uncertainty about their reduction to sea level from great heights, no one has yet suggested any mode in which the barometrical readings could be used. Mr. Scott concluded his address with a notice of the important work by Padre Vines, S.J., of the Havannah, on the "West Indian Hurricanes of 1876 and 1877."

The following gentlemen were elected the Officers and Council for the ensuing year:—

President.—Robert Henry Scott, M.A., F.R.S., F.G.S.

Vice-Presidents.—William Morris Beaufort, F.R.A.S., F.R.G.S., John Knox Laughton, M.A., F.R.A.S., F.R.G.S., Edward Mawley, F.R.H.S., Charles Theodore Williams, M.A., M.D., F.R.C.P.

Treasurer.—Henry Perigal, F.R.A.S.

Trustees.—Hon. Francis Albert Rollo Russell, M.A., Stephen William Silver, F.R.G.S.

Secretaries.—George James Symons, F.R.S., John William Tripe, M.D., M.R.C.P.Ed.

Foreign Secretary.—George Matthews Whipple, B.Sc., F.R.A.S.

Council.—Edmund Douglas Archibald, M.A., George Chatterton, M.A., M.Inst.C.E., John Sanford Dyason, F.R.G.S., Henry Storks Eaton, M.A., William Ellis, F.R.A.S., Charles Harding, Richard Inwards, F.R.A.S., Baldwin Latham, M.Inst.C.E., F.G.S., Robert John Lecky, F.R.A.S., William Marcet, M.D., F.R.S., F.C.S., Cuthbert Edgar Peek, M.A., F.R.A.S., F.R.G.S., Capt. Henry Toynbee, F.R.A.S.

POPULAR PROGNOSTICS.

To the Editor of the Meteorological Magazine.

SIR,—There need not be any mystery respecting the Staffordshire proverb. More than forty years ago I spent a year in the village of Tutbury, and paid frequent visits to the river Dove. Upon the occasion of sudden rains in spring, the river quickly flooded the meadows on each side, and carried with it a quantity of fish, with which it abounded. The flood generally subsided at this time of the

year, as quickly as it had risen, and left many of the small fish upon the grass, which were considered good manure. Hence the proverb. There is another place in Staffordshire which bears a peculiar character both meteorologically and otherwise, viz., Wootton,* which Moll thus describes on page 222 :—

> "As for this Moorland, it is so rugged, foul and cold a Tract, that the Snows continue long undissolved, and the neighbours have a Rhime concerning Wooton, a country village here, by which they intimate that God never was in this place, thus :—
>
> "Wooton under Wever,
> "Where God came never.
>
> "For it stands under Wever-Hill, and it's an observation of the country people in these parts, that the west wind always produces rain, but that the east and south winds, which are wont to bring rain in other places, make fair weather here, unless the wind shifts about from west to south, and this they attribute to their propinquity to the Irish Sea."

Yours faithfully, C. L. PRINCE.

The Observatory, Crowborough, January 17th, 1885.

To the Editor of the Meteorological Magazine.

SIR,—The river Dove separates, during part of its course, the counties of Stafford and Derby, and the meadows upon its banks are very rich and fertile, and a flood in April always makes a very heavy hay crop, or splendid pastures for dairy or feeding purposes. Hence the origin of the couplets you quote in your January number, and they are often used in Staffordshire; to speak of land being as rich as Dove bank is to signify that it is of the highest and best quality; another common saying is that if you drop your walking stick at night in a meadow on Dove Bank, and do not find it at once, you will not the next day, as the grass will have grown over it by the next morning. Hay grown in Dove meadows also takes a most extraordinary amount of making, and is usually made up into large cocks and kept in them for some time to heat, then opened out again and exposed to sun and wind in order to make it dry enough not to fire in the stack; which it would certainly do if cut and carried in the usual manner; at all times the meadows are very green and fresh, and to a dairy farmer are of very great value, from the vast amount of keep, or hay, they will produce.

I do not know if you have received any replies on this subject, but I have often heard my father, who knew the district well, use the very couplet you quote, and you may accept it as authentic.

Yours faithfully, WILLIAM ARNOLD,
(Late of Tamworth.)

Belvoir House, Woodhurst Road, Moseley, near Birmingham, January 21st, 1885.

---

* A Hamlet at the foot of the S.W. slope of the Weaver Hills; it is in the parish of Ellastone. Wootton Hall was built by Inigo Jones, and was in 1766 the residence of Rousseau.—ED.

IS THE RAINFALL OF KANSAS INCREASING?

OUR excellent contemporary, *Science*,* in its 100th number, reports a lecture with the above title, given before the Kansas Academy of Sciences, on November 25th, by Prof. Snow.

We have not space to reprint the whole, but intend to give the opening paragraph, the principal results, and a few remarks upon them.

Before doing so, it may be well to mention the position and area of the state of Kansas. It lies west of the Mississippi, in about 39° N. lat., (*i.e.*, in that of Southern Spain) and in nearly the centre of the United States; its area is given by Hubbard as 88,318 square miles (about three-fourths of that of Great Britain and Ireland).

"Thirty years ago the territory of Kansas was not occupied by the white man, and, if we except a few acres cultivated by the Delaware Indians, no portion of her soil had been turned up by the plough. Her entire area was included within the vast and almost unknown region of the 'treeless plains' and the 'great American desert.' During that brief intervening period, more than a million people, chiefly of the agricultural class, have taken possession of her domain, and have already brought her to the very front rank of the states of the Union in the extent and value of her agricultural products. History affords no other instance of the permanent occupation of so extensive an area, previously unoccupied by man, by so large an agricultural population, in so short a space of time. Here, certainly, if human agency could anywhere affect climate, would such an effect be produced. Here, assuredly, if settlement ever increases rainfall, will such increase be most marked and most unmistakable. That such increase has actually taken place, I believe to be established beyond a doubt. It is a circumstance peculiarly favourable to the determination of the point in question, that, although the general settlement of Kansas by cultivators of the soil is of such recent date, reliable observations upon the rainfall had been made at the military posts upon the eastern borders for a sufficient period to make possible a satisfactory comparison between the rainfall before settlement and after settlement. The records at Fort Leavenworth cover the longest period, and enable us to compare the nineteen years immediately preceding the occupation of Kansas by white settlers, with the nineteen years immediately following such occupation. During the first period the average rainfall was 30·96 inches; during the second period it was 36·21 inches; giving an average increase of 5·21 inches per annum†—an increase of nearly twenty per cent. The Fort Leavenworth records cover so long a period of time (nearly forty years), that the increased average of the second half of the period cannot be attributed to a mere 'accidental variation.' In the issue of *Science* for April 18, 1884, it is stated that 'the supposed increase in the rainfall in the dry region beyond the Mississippi is not borne out by the returns of the signal-service.' But the records of the signal-service upon which this statement was based include a period of only twelve years of observation

* The Science Company, Cambridge, Massachusetts.

† There is here an error, either in arithmetic or printing, of ·04, but the amount is too small to affect the question; we have taken 5·25 as the true value.—ED. *M.M.*

(from 1871 to 1882), which is undoubtedly too short a period for either establishing or disproving the fact of a 'secular' variation."

Prof. Snow then mentions that there are other rather long registers in the State, and that they lead to similar results. No table is given, but it will save much space to throw his statements into that form.

Station.	Total years observed.	Excess of rainfall in the second half of the foregoing period. in inches.	Per cent.
Fort Leavenworth	38	5·25	17
Fort Riley	20	3·05	13
Manhattan	24	5·61	20
Lawrence	17	3·06	9

The position of Kansas renders the thorough examination of these facts most important, and we hope that we may be able to induce Prof. Snow to favour us with the whole of the yearly totals which he has used, and with all obtainable information as to the life history of each station, removals and renewals of the various gauges, &c. We shall readily give all necessary space in order that the question may be thoroughly examined. Experience with the long registers kept in the Old World has convinced us of the difficulty of being sure that differences such as the above are real—*i.e.*, are due to general increase, and not to casual wet or dry periods, or increased accuracy in modes of measurement, removal of gauges from roof tops to ground level, and similar apparently slight changes.

The question is of general importance; it does not concern Kansas alone, and we hope to have Prof. Snow's help in examining it as thoroughly as is possible.

SNOW ROLLERS.

To the Editor of the Meteorological Magazine.

SIR,—On the 13th inst. a large number of "Snow Rollers" were formed here, and as I see from a letter in *Nature*, vol. xxvii., p. 507, that the phenomenon has not often been noticed in England, you may think the circumstance worth recording. I first noticed a few on the 12th, the snow being about 0·5 in. deep, and a strong N. wind blowing; more snow fell in the night and next morning, to a depth of rather more than three inches, and on going out in the afternoon I found all the open fields strewn with a number of rollers, varying in size from that of a hen's egg to cylinders about nine inches in diameter, and about the same length. I did not see any in course of formation, but there were tracks in the snow leading up to them on the windward side. The snow was rather moist, temperature being about the freezing point, and lay light, three in. of snow yielding 0·11 in. of water at 9 a.m. A few of the larger ones were left next day, but the greater part had been blown away.

H. MELLISH.

Hodsock Priory, Worksop, January 15th, 1885.

PENTHEMERIC TABLES.

To the Editor of the Meteorological Magazine.

SIR,—I have invented a Table of Rain which I call a Penthemeric Table, a term which explains itself. It combines in some degree the compactness of a monthly table with the precision of a daily one. In a monthly table, though we have the total of the month, we have not information as to how that quantity of rain was distributed during the month. And in a daily table the eye is bewildered by the long columns and a great number of figures. In a Penthemeric Table you see at a glance what was the pluvial character of each month, what parts of the month were rainy, and what parts were dry.

I subjoin such a table for the rain that fell at Cottingham (East Riding, Yorkshire) last year.—Yours truly,

J. H. HILL.

Hull.

Penthemeric Table of Rain at Cottingham in 1884.

Jan.	Feb.	March,	April.	May.	June.
110	66	51	21	32	12
5	22	65	22	16	51
9	9	15	56	20	0
0	7	4	11	4	4
68	38	5	7	0	7
85	5	32	34	0	0
277	147	172	151	72	74

July.	August.	Sept.	Oct.	Nov.	Dec.
36	0	26	8	25	62
66	31	47	27	17	24
17	10	1	43	5	43
3	6	1	0	34	115
27	2	32	13	11	20
24	76	14	17	28	1
173	125	121	108	120	265

N.B.—Each number represents the hundredths of an inch of rain of five days, except the last number in the month, which relates in some cases to six days, and in February only to three.

THE NEW TIME.

To the Editor of the Meteorological Magazine.

SIR,—I do not think that *Bradshaw* should be blamed for using the old time, for though no doubt if *Bradshaw* were to adopt the new time the general public would soon follow, yet as the change really depends on the railway companies, should not the first step towards its adoption by the public, through *Bradshaw*, be for the companies to agree *among themselves* to use the new time of day? Seing that only one company has done so, and that a small one, surely it was natural for *Bradshaw* to convert its figures back again for the sake of uni-

formity. It would never do to have part of that publication to be printed in one time and part in the other, the only alternative for *Bradshaw* being to convert the old time into the new in the case of all the other companies, and this would be inconvenient as long as the railway companies themselves in their own time-tables and by their officers use the old time. I think that what is really peculiar is that neither meteorologists nor other scientific men nor any authorities have come to a decision as to the date at which the adoption of the new time should take effect.—Yours truly,

T. W. BACKHOUSE.

[We at once accept Mr. Backhouse's correction. It was for the general managers in meeting assembled to consider the subject, and probably they have decided—upon making no change. But our argument remains where it was, except that for the word "Bradshaw" we should have written "railway managers."

It seems to us that, as with many other things, this proposal having been snubbed and shelved at the proper moment, it is to be definitely driven into the limbo of unadopted improvements; one of the most recent arguments proving conclusively (to the arguer's mind, not to ours) that it cannot possibly be adopted before 1890. That it will not be adopted even then we are inclined to believe, for having been checked just when the public were taking up the idea, it will not be easy to arouse them a second time to the advantages of the change. We believe that its adoption for meteorological purposes would be beneficial, but, before adopting it, shall wait until we hear the decision of the Royal Meteorological Society upon the question.—ED.]

DRY DATES IN 1884.

To the Editor of the Meteorological Magazine.

SIR,—On looking over the record of "Rainfall" of 1884, there is one feature which is singular, and I think worthy of notice. I allude to the absence of rain on the 16th and 17th of the month, and it would be interesting to know whether it is peculiar to this district, or has prevailed in other parts.

On January 16th, ·01 was recorded, and ·13 on December 16th, no rain having been registered on the 16th of any one of the ten intervening months; on the 17th of July, ·02 was recorded, and no rain on the 17th of the other eleven months of the year.

On examining records of rainfall of past years, not here, but at Muswell Hill, I find the year 1874 also a dry one, like 1884, shows a somewhat similar characteristic, but not to the same extent, on the 20th of the month of that year, ·01 having fallen on January 20th, and ·03 on Sept. 20th, and no rain on the 20th of the other ten

months, and though rain fell on the 21st of four months of that year, the amounts were very small, being ·01, ·04, ·04, and ·03 only.

I am, Sir, yours faithfully,

J. W. SCOTT.

P.S.—Having access to the daily return of rainfall at Muswell Hill for the past year, I find that the amounts registered on the 16th of each month are exactly the same as here, but those of the 17th differ; ·04 fell on May 17th, ·07 on July 17th, and ·02 on November 17th.

Springlands, Great Stanmore, Middlesex, Jan. 6th, 1885.

IRIDESCENT BANDS.

To the Editor of the Meteorological Magazine.

SIR,—By a typographical error in the *Meteorological Magazine* of this month (p. 192, line 11), an incorrect idea is conveyed as to the remarkable phenomena observed here at sunrise on the 8th and 12th of December, placing a full stop after "it," and a capital T for "towards," making it read as if the openings towards the S.E. only, showed the prismatic colours, one of the most beautiful features in the phenomena was the three distinct bands of prismatic colours completely edging the openings. I should not have thought it worth while calling attention to this error, if it was not that the phenomenon appears not to have been observed before; it was noticed at a meeting of the Royal Society, Edinburgh, last month, and Prof. Tait, I understand, intends investigating it. I have not heard if he has done so yet. I do not think the peculiar and beautiful appearance can be assigned to ice Spiculæ.—I remain, Sir, yours trluy,

P. A. DUDGEON.

January 17th, 1885.

[The line was printed as follows :—

"several openings in it. Towards the S.E. these openings were, &c."

It should have been—

"several openings in it towards the S.E. ; these openings were, &c."

We agree with Mr. Dudgeon as to the rarity of the appearance. We may, however, refer those interested to Herschell's *Meteorology*, 1861, p. 224.—ED.]

LIGHTNING CONDUCTORS IN SCANDINAVIA.—Professor Mohn, of Christiania, who was commissioned by the Swedish Government to hold an official inquiry as to the degree of protection afforded by lightning conductors, ascertained that lighthouses, telegraph stations, and other bulidings, very much exposed, but provided with lightning conductors, suffered considerably less than the churches, which are in Norway generally not protected against lightning. Out of 100 churches struck, only three were provided with lightning conductors. In one, the conductor of which was in good condition no damage was done. In the second, the conductor, which was of zinc, was melted. In the third, the conductor was eaten by rust where it entered the soil; and the church was set on fire.—*Electrician.*

DENTON'S UNCHANGEABLE THERMOMETERS.

Meteorologists have long been familiar (unpleasantly so) with the fact that mercurial thermometers read higher the older they are. The largest proportion of the total rise takes place immediately after they are made, and consequently it has for many years been the practice of the best opticians to make and fill the tubes long before putting on the divisions; in some cases, we believe, that tubes are laid by for as long as three years. Even after that period a slight rise occurs, and this "shifting of the zero point," as it is called, renders necessary from time to time the re-determination of the index error.

Mr. Denton exhibited to the Meteorological Society on November 15th, 1882, a number of thermometers, which, by some special process in construction, he stated were not liable to change; and in proof thereof produced certificates of the thermometers showing that although verified within a few months of their being made, there had, within a twelvemonth, been scarcely a rise of 0°·1.*

Mr. Denton sent these same thermometers to the Health Exhibition. The Jury selected six (four ordinary and two clinical), and sent them to Kew for a fourth verification. The results were so satisfactory that they awarded a silver medal. We annex a table of the results of each verification, which show that the change never exceeds 0°·2, is generally 0°·1 and frequently *nil*.

No. of Thermometer.	Date of Verification.	CORRECTIONS AT 32°	42°	52°	62°	72°	82°	92°	Mean.
19328	June, 1881.....	·0	·0	—·1	·0	·0	·0	·0	—·014
	January, 1882..	—·1	—·2	—·2	—·1	—·1	—·1	—·1	—·103
	June, 1882.....	—·1	—·1	—·1	—·1	—·1	—·1	—·1	—·100
	July, 1884	—·1	—·1	—·1	—·1	—·1	—·1	—·1	—·100
19329	June, 1881.....	·0	·0	—·1	·0	·0	·0	·0	—·014
	January, 1882..	—·2	—·2	—·2	—·1	—·1	—·2	—·1	—·157
	June, 1882.....	—·2	—·1	—·1	—·1	—·1	—·2	—·1	—·128
	July, 1884	—·2	—·1	—·1	—·1	—·1	—·2	—·1	—·128
19332	June, 1881.....	·0	·0	—·1	·0	·0	—·1	—·1	—·043
	January, 1882..	—·1	—·2	—·2	—·1	—·1	—·1	—·1	—·128
	June, 1882.....	—·1	—·1	—·1	—·1	—·1	—·1	—·1	—·100
	July, 1884	—·1	—·1	—·1	—·1	—·1	—·1	—·1	—·100
19336	June, 1881.....	·0	—·1	·0	·0	·0	·0	·0	—·014
	January, 1882..	—·2	—·3	—·2	—·2	—·2	—·2	—·1	—·200
	June, 1882.....	—·1	—·2	—·2	—·2	—·2	—·1	—·1	—·157
	July, 1884	—·1	—·2	—·2	—·2	—·2	—·1	—·1	·157

**Met. Mag.*, vol. xvii. p. 168 (December, 1882.).

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1884.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	81·7	27	40·6	1	69·7	50·0	49·5	73	107·3	45·7	2·84	7	6·4
Malta	79·2	30	57·4	14	74·9	62·7	59·7	75	137·8	52·5	·54	4	3·9
Mauritius	77·7	1	57·4	4	75·3	64·9	61·1	75	122·5	46·2	1·06	13	4·4
Calcutta	94·5	5	70·2	6	90·3	76·7	77·2	84	158·9	67·4	11·72	19	6·3
Bombay	92·1	10	75·6	20	88·6	79·4	76·7	78	143·9	73·8	13·25	16	5·5
Ceylon, Colombo	86·2	9	74·8	30	84·7	78·4	73·7	77	141·2	65·2	7·39	17	7·5
Melbourne	68·1	2	34·0	30	58·2	43·9	43·1	77	111·0	28·2	·84	10	6·1
Adelaide	72·2	3	39·6	30	60·0	47·9	46·3	75	128·9	32·2	4·56	23	5·8
Wellington	...	...	...	...	...		...	..	...	...	...	...	...
Auckland	63·0	12	37·0	1	57·9	48·1	46·6	78	115·0	29·0	4·23	18	6·7
Jamaica, Kingston	90·4	7	70·5	2	86·8	73·3	73·1	80	...	...	1·77	...	7·1
Barbados	84·0	1	71·0	var.	82·0	73·0	71·7	84	153·0	69·0	5·68	13	6·0
Toronto	84·3	23	42·9	1	75·9	53·4	56·4	72	144·0	35·8	2·20	8	6·8
New Brunswick, Fredericton	92·7	29	33·0	1	76·6	48·6	51·0	66	...	...	4·23	15	4·3
Manitoba, Winnipeg	88·5	22	39·2	9	74·7	54·8	57·1	73	...	...	2·53	8	6·8
British Columbia, Spence's Bridge	...	...	...	...	...	...	...	...	...	...	...	...	...

REMARKS, JUNE, 1884.

MALTA.—Mean temp., 68°·0; mean hourly velocity of wind, 10·3 miles, on 19th velocity averaged 26 miles for 4 hours; sea temp. rose from 70° to 74°. The after-glow at sunset continued, and was of a pale rose colour. J. SCOLES.

Mauritius.—Rainfall 0·86 in., and mean temp. 0°·6 below their respective averages; max. velocity of wind 27·1 miles on 23rd, min. 2·3 miles on 4th; prevailing direction S.E. to E. Coloured skies before sunrise and after sunset every day, beginning 1h. 14m. before sunrise, and ending 1h. 14m. after sunset. Prevailing colours orange and yellow, much less intense than in September to January last. C. MELDRUM, F.R.S.

CEYLON.—Thunderstorms occurred on five days. J. H. SYMONDS.

Melbourne.—Mean temp. 0°·7 above average; temp. of dew-point, humidity, amount of cloud and pressure all more or less below it; total rain 1·13 in. below it Prevailing winds N. and N.E., strong breezes on eight days. Heavy dew on six days; hoar frost on three days. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure the lowest in January since 1875; mean temp. slightly above the average; the max. on 3rd being the highest in June since 1865. Rainfall 1·96 in. above the average. The Zodiacal light was visible on three evenings, and the red glow was seen shortly after sunset on most clear evenings. C. TODD.

Auckland.—From 1st to 7th fine, with light S. and E. winds, and sharp frosts on 1st, 2nd, and 3rd; from 8th to the 20th unsettled and showery with N.E. gales; from 25th to end of month, squally and showery with light S.W. winds. Pressure above the average; mean temp. and rainfall a little below it. T. F. CHEESEMAN.

BARBADOS.—Mean temp., 76°·8, 0°·5 below the average. Wind N.E., mean hourly velocity 11·5 miles, which is about the average; extremes 16·5 miles and 7 miles. Rainfall 1 per cent. above the average; four days were overcast.

R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	2·57	XI.	Rhayader, Nantgwillt..	6·64
,,	Margate, Birchington...	2·07	,,	Carno, Tybrith	4·83
,,	Littlehampton	1·45	,,	Corwen, Rhug	1·17
,,	Hailsham	2·64	,,	Port Madoc	4·15
,,	I. of W., St. Lawrence.	2·15	,,	I. of Man, Douglas	3·43
,,	Alton, Ashdell.....	3·36	XII.	Stoneykirk, Ardwell Ho.	1·68
III.	Winslow, Addington ...	2·04	,,	Melrose, Abbey Gate...	2·54
,,	Oxford, Magdalen Col...	2·17	XIII.	N. Esk Res. [Penicuick]	2·50
,,	Northampton	1·42	XIV.	Ayr, Cassillis House ...	2·53
,,	Cambridge, Beech Ho...	1·58	,,	Glasgow, Queen's Park.	2·45
,,	Wisbech, Bank House..	1·42	XV.	Islay, Gruinart School..	5·14
IV.	Southend	1·27	XVI.	St. Andrews, Newton Bk.	1·18
,,	Harlow, Sheering	1·48	,,	Balquhidder, Stronvar..	7·08
,,	Rendlesham Hall	2·03	,,	Dunkeld, Inver Braan..	3·24
,,	Diss	2·46	,,	Dalnaspidal H.R.S. ...	4·65
,,	Swaffham	2·81	XVII.	Keith H.R.S.	1·43
V.	Salisbury, Alderbury...	2·76	,,	Forres H.R.S.	1·07
,,	Warminster	3·22	XVIII.	Strome Ferry H.R.S....	4·36
,,	Calne, Compton Bassett	2·78	,,	Lochbroom	3·78
,,	Ashburton, Holne Vic..	5·81	,,	Tain, Springfield.....	1·48
,,	Holsworthy, Clawton...	2·67	,,	Loch Shiel, Glenaladale	6·84
,,	Hatherleigh, Winsford.	2·60	,,	Invergarry	5·13
,,	Lynmouth, Glenthorne.	3·69	XIX.	Lairg H.R.S.	...
,,	Probus, Lamellyn	3·36	,,	Forsinard H.R.S.	1·61
,,	Wincanton, Stowell Rec.	3·13	,,	Watten H.R.S.	1·57
,,	Taunton, Fullands	...	XX.	Dunmanway, Coolkelure	8·07
VI.	Bristol, Clifton	2·73	,,	Fermoy, Gas Works ...	3·52
,,	Ross	2·95	,,	Tralee, Castlemorris ...	3·14
,,	Wem, Sansaw Hall.....	1·85	,,	Tipperary, Henry Street	4·12
,,	Cheadle, The Heath Ho.	1·83	,,	Newcastle West	3·73
,,	Worcester, Diglis Lock	1·59	,,	Miltown Malbay.....	3·71
,,	Coventry, Coundon	2·03	,,	Corofin	...
VII.	Melton, Coston	1·61	XXI.	Carlow, Browne's Hill..	3·08
,,	Ketton Hall [Stamford]	1·23	,,	Navan, Balrath	1·53
,,	Horncastle, Bucknall ...	1·81	,,	Mullingar, Belvedere ...	2·55
,,	Mansfield, St. John's St.	2·22	,,	Athlone, Twyford	2·34
VIII.	Macclesfield, The Park	2·18	XXII.	Galway, Queen's Col....	2·87
,,	Walton-on-the-Hill.....	1·66	,,	Clifden, Kylemore	10·46
,,	Lancaster, South Road.	2·33	,,	Crossmolina, Enniscoe..	5·23
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	3·27
IX.	Wakefield, Stanley Vic.	·92	XXIII.	Dowra	...
,,	Ripon, Mickley	2·31	,,	Rockcorry.....	...
,,	Scarborough.....	1·97	,,	Warrenpoint	2·81
,,	East Layton [Darlington]	1·86	,,	Newtownards	1·69
,,	Middleton, Mickleton..	2·95	,,	Belfast, New Barnsley .	3·03
X.	Haltwhistle, Unthank..	1·68	,,	Cushendun	2·52
,,	Shap, Copy Hill	5·03	,,	Bushmills	...
XI.	Llanfrechfa Grange	3·71	,,	Stewartstown	2·73
,,	Llandovery	4·48	,,	Buncrana	2·94
,,	Castle Malgwyn	3·89			

JANUARY, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max Deg.	Date	Min. Deg	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·43	— ·92	·31	10	16	53·3	29	22·8	22	19	20
II.		Maidstone (Hunton Court)...	2·47	— ·10	·49	31	16	...	...	...	...	...	...
,,		Strathfield Turgiss	2·98	+ ·43	1·01	31	14	55·0	29	21·7	20	20	21
III.		Hitchin	2·25	+ ·03	·59	31	15	51·0	29	19·0	21	25	...
,,		Banbury	1·75	— ·63	·22	9, 30	18	51·0	28*b*	20·5	22	25	...
IV.		Bury St. Edmunds (Culford)	2·82	+ ·98	·93	12	18	54·0	29	23·0	22	21	...
,,		Norwich (Cossey)	2·45	+ ·75	·49	10	16	53·5	29	20·0	14	21	20
V.		Weymouth(LangtonHerring)	2·66	...	·55	29	16	...	...	...	...	...	...
,,		Barnstaple.....	3·16	— 1·10	·59	7	18	56·0	30	30·0	6	...	...
,,		Bodmin	3·88	— 2·63	·78	28	20	52·0	29	27·0	14	10	17
VI.		Stroud (Upfield)	2·47	— ·45	·52	9	16	52·0	29	26·0	5	20	...
,,		ChurchStretton(Woolstaston)	2·57	— ·86	·56	28	16	50·5	29	24·0	22	21	22
,,		Tenbury (Orleton)	2·06	— ·93	·50	28	17	53·2	29	21·5	6	19	24
VII.		Leicester	1·78	...	·31	10	18	52·2	29	22·5	22	17	26
,,		Boston	1·86	+ ·14	·40	10	16	54·0	29	26·0	22	15	...
,,		Grimsby (Killingholme).....	2·05	+ ·29	·29	12	20	54·0	29	27·0	22	11	...
,,		Hesley Hall [Tickhill].....	1·25	...	·18	28	17	55·0	29	20·0	22	20	...
VIII.		Manchester (Ardwick).....	1·81	— 1·43	·54	10	10	52·0	29*c*	24·0	22	18	...
IX.		Wetherby (Ribston Hall) ...	2·13	— ·09	·42	29	14	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·11	— 1·82	1·29	28	20	50·0	29	27·0	22	17	...
X.		North Shields	1·88	+ ·04	·58	11	15	54·8	29	27·4	22*e*	14	14
,,		Borrowdale (Seathwaite).....	11·36	— 7·39	1·85	28	14	50·0	29	25·0	23	5	...
XI.	WALES.	Cardiff (Ely).....	3·47	— 1·24	·66	9	18	...	...	...	...	...	...
,,		Haverfordwest	4·43	— 1·84	·60	25	19	51·0	29*c*	27·0	6	12	17
,,		Plinlimmon (Cwmsymlog) ...	3·66	...	1·15	9	14	...	...	...	...	...	...
,,		Llandudno.....	1·33	— 1·63	·18	9*a*	15	55·2	29	27·0	21	...	...
XII.		Cargen [Dumfries]	3·68	— 2·43	·84	28	14	49·2	29	24·2	22	16	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	..	...	...
XIV.		Douglas Castle (Newmains)	3·57	— 1·87	1·27	31	13	...	...	...	..	...	...
XV.		Lochgilphead (Kilmory).....	5·07	— 2·80	·68	8	15	...	...	...	..	...	...
,,		Oban (Craigvarren)	4·65	...	1·08	8	14	52·0	4	25·0	15	10	...
,,		Mull (Quinish).....	4·97	..	·92	4	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·70	— 1·12	·40	10*b*	13	...	...	...	...	...	...
,,		Arbroath	1·59	— ·86	·31	28	16	46·0	29*c*	23·0	16	16	...
XVII.		Braemar	2·87	+ ·09	·41	7	16	46·2	5	4·8	16	26	29
,,		Aberdeen	1·74	...	·32	4	20	47·0	29	19·0	15	12	...
XVIII		Skye (Sligachan)	10·17	...	3·00	5	14	...	...	...	...	...	...
,,		Culloden	1·47	— ·30	...	...	...	47·0	26	15·0	21	17	30
XIX.		Dunrobin	2·17	...	·42	10	11	50·0	5	22·0	21	18	...
,,		Orkney (Sandwick)	2·14	— 1·20	·50	9	13	49·2	5	30·2	17	4	21
XX.		Cork (Blackrock)	4·99	— 1·03	·91	25	20	53·0	10*d*	27·0	13	10	...
,,		Dromore Castle	6·62	...	1·00	10*c*	20	53·0	5	28·0	13	...	...
,,		Waterford (Brook Lodge) ...	4·26	...	·63	2	20	52·0	26	27·0	14	9	17
,,		Killaloe	3·95	...	·72	9	19	53·0	31	26·0	19	12	...
XXI.		Portarlington	2·37	— ·69	·76	2	22	52·0	27	26·0	14	13	...
,,		Dublin (FitzWilliam Square)	1·62	— ·64	·32	7	23	53·7	29	29·0	13	5	12
XXII.		Ballinasloe	2·73	— 1·63	·40	31	22	50·0	26	24·0	14*f*	18	...
XXIII		Waringstown	1·97	— 1·44	·31	27	18	56·0	29	24·0	12	13	18
,,		Londonderry (Creggan Res.).	2·69	...	·37	10	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·90	— ·87	·51	27	21	51·0	27	26·0	8	12	15

a And 28, 31. *b* And 29. *c* And 30. *d* And 26. *e* And 23. *f* And 19.
+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON JANUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for SLOW.

ENGLAND.

STRATHFIELD TURGISS.—The early part of the month was fair and cold, the latter part wet and stormy. A robin's nest with two eggs was found on 2nd, and on the 7th a nest of young sparrows; on 5th a female brimstone butterfly emerged from the pupa; thrushes heard on 23rd.

CULFORD.—The most noteable features of the month were the frequent high winds, the heavy fall of S on the 12th, and the numerous white frosts.

LANGTON HERRING.—From the 12th to 22nd the weather was cold; most of the days were gloomy and foggy, and the range of temp. was small. The 30th and 31st were stormy, with vivid L and T on the latter day. The roaring of the sea on the 29th and 30th was very noticeable. Mean temp. 2° below the average.

BODMIN.—Mean temp. 39°·6.

STROUD.—A dry, pleasant month, but not much sun. S.S.W. gale on 29th. Sheet L in S.E. from 6 to 8 p.m. on 31st.

WOOLSTASTON.—A seasonable month of winter weather, with sharp frost nearly every day till the 25th, when a rapid thaw set in. S fell on the 17th Mean temp. 35°·5.

ORLETON.—The temp. of the first 11 days was variable, with occasional severe frosts, but as a whole was above the average; it then became much lower than the average and very steady, with a strong N. or E. wind till the 26th. The remainder of the month was warm and rainy. Mean temp. of the month about 1°·5 above the average. The rainfall was very small till the 24th, and the roads and fields were unusually dry, but after that date R fell every day. The sky was generally obscured by clouds, and from the 13th to the 27th the sun was only once seen for a few minutes. Strong winds prevailed nearly all the month. Frequent L was seen in S.W. on the night of the 31st.

LEICESTER.—The month was dry, but dull, with very little sunshine. Temp. very variable. S fell on 3 days, and there was much hoar frost.

KILLINGHOLME.—A seasonable month, though vegetation was more backward than in the preceding years, with signs of spring at the close; no heavy gales; much S on 12th and 13th.

MANCHESTER.—The month was, on the whole, dry and not very wintry, although at times the temp. fell rather low. The weather, though not bright, was fairly free from fogs.

WALES.

HAVERFORDWEST.—The month commenced cold, stormy and wet; from the 5th to the 13th it rained every day, with cold, bleak air. S fell in considerable quantities on the 12th, covering the high ground in the N.E. and the Precelly range. S fell also on 13th and 17th. The weather from the 13th to the 23rd was very cold and frosty, accompanied by a bitter E. wind, which at times almost reached the force of a gale; the 21st was a very severe day with a gale from the E., overcast sky, and mean temp. for the 24 hours of 31°·1; from 19th to 23rd dark weather prevailed, the sun never being visible. Mean temp. of the month slightly below the average. L H and R on 11th. Remarkable spring tides prevailed on 3 or 4 days, and on 31st did much damage at Newgate; a strong W. gale caused the waves to break over the bank of pebbles which extends for fully 2 miles and rises 20 or 25 feet above the sands. Such an occurrence has not taken place since January, 1869.

LLANDUDNO.—A month of rather chequered weather. The mean temp., however, was but little below the average; from the 11th to the 21st, inclusive, the wind blew from an easterly point, it was dull and hazy, but not a drop of

R fell; after the latter date the weather was markedly milder, and the month went out with a heavy gale on the 31st. No frosts of great severity, not enough to kill or materially damage geraniums, veronicas, stocks and wallflowers. Snowdrops were blooming in abundance at the close.

SCOTLAND.

CARGEN.—A very dull month, the hours of sunshine being only 35 as compared with an average of 62 hours. Mean temp. 36°·7, 1°·6 below the average. Strong gales on 7th, 10th and 31st.

OBAN.—There were, as in the preceding month, two distinct periods of R and an interval of frost, the latter being, in this case, much more marked and prolonged. So fine a January, and one so free from storms has not been experienced here for some years. S on 9th. H on 5th, 6th and 8th.

QUINISH.—The first 11 days were wet and stormy, followed by fine and frosty weather with bright sunshine till the 24th, after which mild damp weather prevailed to the close. Heavy gale, with T and L on the 6th.

ABERDEEN.—With the exception of a week of cold, frosty weather about the middle, the month was fine and open, with a rainfall considerably below the average. S fell on four days. Aurora was observed on only one night. Fresh gale from S. on 31st.

CULLODEN.—Very severe frost prevailed during the entire month, interrupting field labour. R fell only during the first and closing weeks.

IRELAND.

DROMORE.—The month was very stormy at times, the later part being very wet and cold.

KILLALOE.—Rainfall moderate; frosts frequent but slight, weather generally very favourable for the time of year. Wind blew heavily from S.W. on night of 27th.

DUBLIN.—A dull month of average temp., with a remarkable prevalence of S.E. winds, densely clouded skies, and a deficient rainfall, scattered, however, over an excess of rainy days. The last few days were warm and very unsettled with squally S. winds, and frequent showers by night. The mean temp. (40°·8) was exactly equal to the average, and identical with that of the preceding month. Mean humidity 84; mean amount of cloud 6·8; prevailing winds S.S.E., S.E., and W.S.W. Solar halo on 5th; luuar on 27th; L on 31st; S or sleet on three days; H on three days; more or less fog on four days; lunar rainbow on 31st; gales on the 8th, 10th, 17th, 28th and 31st.

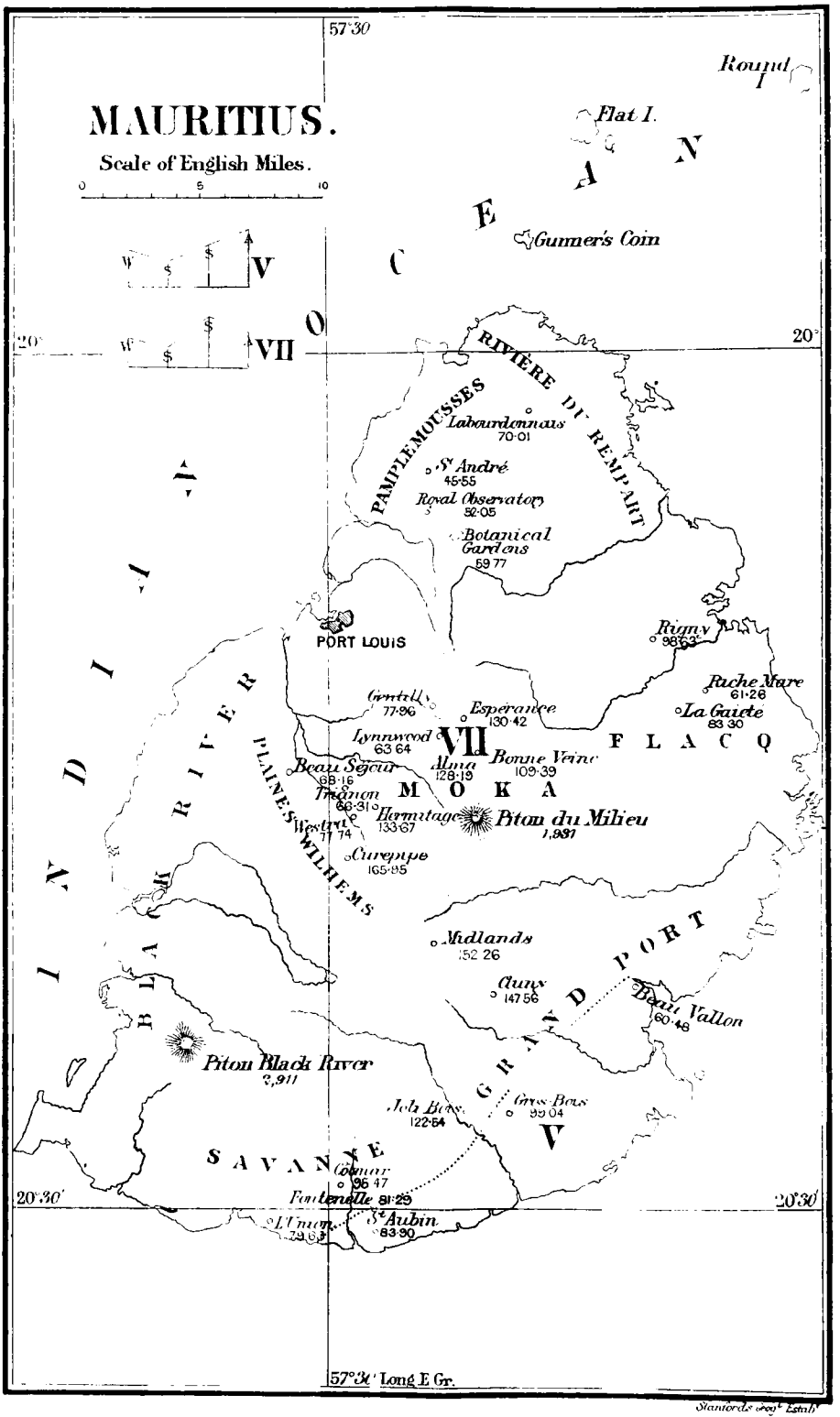
WARINGSTOWN.—The early part of the month was very dry, in fact up to the 26th it bade fair to be the driest January on record.

EDENFEL.—The unsettled rainy weather which prevailed up to the 12th gave way on that day to a light fall of S, followed by 10 days of calm, generally clear weather and light pleasant frosts, the temp. keeping between 36° and 26°. The last week was mild and showery, but generally clear and fine.

SCRAPS.

THUNDERSTORMS.—DR. S. HOPPE, of Hamburg, recently stated before the Congress of Medical Men and Physicists of that city, as the result of his experiments, that the flowing of a column of warm, moist air into a colder atmosphere will be followed by a thunderstorm if the electricity generated by the friction of the air is not diffused and neutralized by the condition of the surrounding atmosphere. It should not be forgotten that the vapour of water or of moist air has long been known to develope electrical disturbances.—*Athenæum, 24th January, 1885.*

THERMOMETER SCALES.—"A thermometer is not without honour, save in its own country," quotes a French paper, and proves it thus. In France, the thermometer in use is that of Celsius, a Swede; in Germany and Russia, that of Réaumur, a Frenchman; in England and America, that of the German Fahrenheit; while the Swedes disown their countryman, and are guided by hat of Leslie, a Scotchman. [? as regards the last statement.—ED.]


MAURITIUS.
Scale of English Miles.
0 5 10
57°30
Round I.
Flat I.
INDIAN OCEAN
Gunner's Coin
V
VII
20°
20°30'
RIVIÈRE DU REMPART
PAMPLEMOUSSES
Labourdonnais 70·01
St André 45·55
Royal Observatory 52·05
Botanical Gardens 59·77
PORT LOUIS
Rigny 98·33
Ruche Mare 61·26
La Gaiete 83·30
Esperance 130·42
Central 77·96
Lynnwood 63·64
VII
FLACQ
Beau Segour 68·16
Alma 128·19
Bonne Veine 109·39
Tranquebar 66·31
MOKA
Hermitage
Piton du Milieu 1,991
Western 77·74
133·67
Curepipe 165·95
PLAINES WILHEMS
RIVER
BLACK
Midlands 152·26
Curepipe 147·56
GRAND PORT
Beau Vallon 60·48
Piton Black River 2,911
Joli Bois 122·54
Gros Bois 99·04
V
SAVANNE
Coromar 96·47
Fontenelle 81·29
L'Union 79·63
St Aubin 83·90
57°30' Long E Gr.
Stanford's Geog.l Estab.t

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

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THE CLIMATE OF ASSAB.*

The first thing requisite is to state where Assab is. It is a very small place, on a bay of the same name, in the east of Abyssinia, at the southern extremity of the Red Sea, opposite to Mocha and just north of the Straits of Bab-el-Mandeb.

The pamphlet before us is a reprint of a popular article written by Prof. Ragona for the daily journal, *Il Panaro*, and is based upon the observations made daily at 9 a.m., 3 p.m., and 9 p.m. at Assab in 1882 and printed in extenso in Vol. IV. part II. of the Italian *Annali dell' Ufficio centrale di Meteorologia.*

Neither in the *Annali* nor in Prof. Ragona's pamphlet is anything said as to the position of the instruments, but the publication by Sig. Tacchini of the observations implies that it was reasonably good.

The immediate vicinity of Assab has long been considered the hottest region in the world. Massowah which is on the same coast of the Red Sea, but about 300 miles further N.W.† is described by Hann as remarkable for its extraordinary and constant heat. Prof. Rohlfs asserts (but the following table seems to show that his records were too high) that the spring water from depths of 12 ft. to 15 ft., was from 93° to 95°, while the air temperature had reached 129° or even 134°.

We cannot accept the mean temperature (87·1) given by Prof. Ragona since it is $\frac{9+3+9}{3}$ which is obviously a little too high. In the absence of observations at 3 a.m., it is far better to ignore the 3 p.m. readings and take $\frac{9+9}{2}$.

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* *Sul Clima di Assab*, by Prof. Domenico Ragona. Modena, Moneti e Namias, 1885.

† By the bye it is in the same latitude as Khartoum; Massowah and Khartoum being at the W. and E. extremities of the base of an equilateral triangle of which Suakim is the Northern apex.

Unfortunately the minimum thermometer was not recorded after May 6th, consequently its readings cannot be utilized.

However, there still exist data of considerable importance, and we here give the results converted into Fahrenheit degrees; and alongside we give the figures for Aden (which is about 100 miles further East) from Mr. Blanford's *Report on the Meteorology of India*, for 1882.

Shade Temperature at Assab and at Aden, in 1882.

	Assab.						Aden.				
				Mean.	Absolute.				Mean.	Absolute.	
	9 a.m.	3 p.m.	9 .m.	9 & 9.	Max.	min.	8 a.m.	4 p.m.	M. & m.	Max.	min.
	deg.	deg.	deg.	deg.	deg.	deg.	deg.	deg.	deg.	deg.	deg.
Jan.....	79·7	82·0	79·0	79·3	83·7	70·0	77·5	78·7	77·5	84·5	68·9
Feb.....	80·1	81·7	79·5	79·8	84·2	70·3	77·9	78·9	78·0	86·8	71·4
March...	81·9	84·6	80·8	81·4	88·7	72·5	79·1	80·6	79·6	89·3	71·1
April ...	86·7	89·8	84·2	85·4	95·9	74·5	83·8	86·3	83·8	97·9	72·9
May.....	90·5	92·5	87·3	88·9	101·8	77·9	88·6	90·3	88·2	100·8	74·4
June ...	93·4	95·2	89·8	91·6	100·8	—	89·3	90·3	88·4	97·3	80·6
July.....	95·0	96·1	90·9	93·0	107·2	—	84·9	88·3	85·5	97·9	71·9
Aug. ...	95·5	95·5	91·2	93·3	104·4	—	86·5	87·9	86·1	97·3	72·9
Sept. ...	93·2	94·8	90·7	92·0	98·6	—	88·6	89·6	88·0	98·3	79·8
Oct.....	88·9	91·0	86·5	87·7	95·0	—	86·1	85·6	84·4	96·3	72·7
Nov. ...	83·5	85·5	81·1	82·3	87·8	—	80·2	81·7	79·0	89·8	68·9
Dec. ...	81·0	82·9	79·3	80·2	87·4	—	77·6	78·0	77·1	86·3	67·1
Year.....	87·4	89·2	85·1	86·2	94·6	—	83·3	84·7	82·9	93·5	72·7

Assab is, therefore, hotter by about 3° than even Aden, but this is compensated by the air being dry (mean relative humidity about 52 at Assab, against about 70 at Aden) and this prevents these high temperatures being insupportable; but the nights at Assab are evidently very hot, four consecutive months with 9 p.m. temperatures averaging over 90°, and rarely below 88°, is very serious. At the same time, it must be remembered that the day Maxima, both at Aden and at Assab, are far below what occur in South Australia; for instance, at Adelaide, the first of Mr. Todd's volumes that we take up, gives Maxima in three months of 1879 of 110°·7, 106°·9, and 103°·4 respectively.

WHIRLWIND IN THE COUNTY KILDARE.

About 11.32 a.m. on Monday, February 2nd, 1885, a whirlwind struck the south end of Sherlockstown House, stripping off the slates, and whirling them in the air like so many sheets of paper. The south end of the roof was wrecked. Some of the slates, which were of unusual size (3 ft. 4 in. by 2 ft. 6 in.) and very heavy, were carried more than 120 feet, striking and making holes in other parts of the roof. The Rev. W. Sherlock, who was in the garden at the time, heard the sudden roar of the wind, and saw the slates ripped from the roof in a moment. The whirlwind appears to have been perfectly local, and, after touching the house, did no further damage than to twist off part of the head of an old Scotch fir tree, standing about 200 yards to the north-east.

RAINFALL OF CAPE COLONY.

WE take the earliest opportunity of noticing a very important communication received from Mr. J. G. Gamble, M.Inst.C.E., who has for some years been residing in South Africa, and whose presence as a member of the Cape of Good Hope Meteorological Commission must have materially strengthened that body.

The communication consists merely of seven sheets of lithographs and as they are of foolscap folio size we hope that they are intended, to appear as part of the next report of the commission.

They contain diagrams epitomizing all the best rainfall registers in the Colony; they give for each of 33 stations the average monthly fall, based on the whole of the years observed, which varies from a minimum of five to a maximum of forty-two years. The average period is thirteen years, and 15 of the stations have been in operation for that period or upwards.

The seasonal distribution is entirely opposite in different parts. Near Cape Town the stations show heavy winter rains (May to August), *e.g.*, at Wynberg and Bishop's Court the average for each of those months is about eight inches and for the four summer months (Dec. to March), about one inch. On the other hand, in the extreme east of the Colony, near its frontiers to Basuto Land and Kaffraria, we have at Queenstown and at Aliwal North averages of less than an inch in winter, and of three to five inches in summer.

As regards total fall, the short (five years) average for Pella (Bushmanland) Lat. 29°4′, S., Lon. 19°12′, E. is remarkable. In no month does the average reach half an inch. No rain has ever fallen in November, and the yearly total must be about two inches and a half. On referring to the reports of the Commission, we find the actual values for Pella to be—

Year.....	1878	1879	1880	1881	1882	Average.
Total Rainfall...	1·55 in.	3·92 in.	1·42 in.	3·29 in.	2·66 in.	2·57 in.

On the contrary, at the first mentioned stations Wynberg and Bishop's Court, which are both near Cape Town, the average totals are about 43 and 54 inches respectively.

DISTRIBUTION OF RAIN IN MAURITIUS DURING THE DECADE, 1871–80.

By Prof. V. RAULIN, of Bordeaux.

MAURITIUS is approximately semi-circular in shape, its longer axis lying S.S.W.-N.N.E., and its centre in latitude 20° 15′ S. Like Réunion (or Bourbon), it is a volcanic island, but without any crater in activity; there is a tolerably marked mountainous plateau, but none of the peaks are high, the principal being Piton du Milieu, 1931 feet, and the Piton of the Black River Mountains in the S.W., which reaches 2911 feet.

Dr. C. Meldrum, F.R.S., Director of the Royal Alfred Observatory,

publishes annually the *Results of the Meteorological Observations* made in the Colony, and has been kind enough to furnish me with copies.

Observations during the above decade have been made at sixty stations, but there are only 28 available for the determination of seasonal rainfall; twenty-two extending over from 8 to 10 years, and six from 4 to 7 years.

The *yearly totals* generally range from 80 to 100 inches. The amount is less at three eastern stations, where it falls to 60·48 in., and still less at six stations in the N.W., where it falls as low as 45·55 in. The rain is much heavier in the centre of the Island, and six stations in a line from N. to S. have falls ranging from 128·19 in. to 165·95 in.

The *seasonal distribution* is much more uniform than in Southern India, or at the Cape of Good Hope.

Régime VII. (Winter and summer wet) prevails almost everywhere.

Régime V. (Winter and autumn wet, spring and summer rather dry) is found only at five stations on the south coast.

RAINFALL IN MAURITIUS.

Stations.	Height	Years.	Summ'r.	Aut'mn.	Winter.	Spring.	Year.
RÉGIME VII. *Winter and Summer wet.* (A) East and South Coast.							
	ft.		in.	in.	in.	in.	in.
1. Labourdonnais	280	1871-80 (10)	28·59	23·94	10·59	6·89	70·01
2. Rigny	300?	1873-80 (8)	36·10	32·30	17·59	12·64	98·63
3. Riche Mare	160	1871-80 (10)	22·40	20·49	11·62	6·75	61·26
4. La Gaieté	120?	1871-79 (8)	32·43	27·50	14·28	9·09	83·30
5. Midlands	1420	1873-80 (8)	49·78	49·44	32·61	20·43	152·26
6. Cluny	1000	1871-80 (9)	52·54	46·72	31·25	17·03	147·56
7. Joli Bois	550	1871-80 (10)	41·10	40·96	25·25	15·23	122·54
8. Colmar	700	1871-80 (9¾)	33·70	32·10	17·64	12·03	95·47
9. L'Union	80	1871-80 (10)	28·45	25·81	14·93	10·44	79·63
(B) West Coast and Inland.							
10. Botanical Gardens	215	1871-80 (10)	25·32	20·17	8·47	5·81	59·77
11. St. André	184	1872-80 (9)	18·48	17·10	5·92	4·05	45·55
12. RoyalAlfredObservatory	179	1871-80 (10)	22·18	18·45	6·36	5·06	52·05
13. Hermitage	?	1871-75 (5)	49·26	40·33	28·42	15·66	133·67
14. Bonne Veine	1400	1871-80 (10)	41·64	34·11	20·18	13·46	109·39
15. Alma	1380	1871-80 (9½)	50·37	39·42	23·68	14·72	128·19
16. Espérance	1420	1871-80 (10)	50·66	41·51	23·65	14·60	130·42
17. Gentilly	1200	1871-80 (9½)	34·88	23·71	11·69	7·68	77·96
18. Lynnwood	1080	1876-80 (5)	29·39	19·66	9·38	5·21	63·64
19. Curepipe	1700	1871-77 (4½)	60·31	52·77	35·95	16·92	165·95
20. Westra	1300	1871-80 (10)	30·13	25·27	14·64	7·70	77·74
21. Beau Séjour	970	1871-80 (10)	30·39	23·62	8·45	5·70	68·16
22. Trianon	1000	1871-80 (9¾)	28·56	22·37	9·43	5·95	66·31
23. Dry-Burn*	?	1873-78 (5¼)	31·23	24·72	11·24	7·11	74·30
RÉGIME V. *Winter and Autumn wet, Spring and Summer rather dry.*							
24. Beau Vallon	240	1871-80 (10)	21·32	21·83	10·28	7·05	60·48
25. Gros Bois	500	1871-80 (10)	32·40	34·30	18·92	13·42	99·04
26. Fontenelle	250	1875-80 (6)	26·76	26·87	15·74	11·92	81·29
27. St. Aubin	300?	1871-80 (10)	28·49	29·15	15·08	14·18	83·90
28. Highlands*	?	1874-79 (6½)	29·41	30·36	14·00	8·48	82·25

* The position of these stations being unknown, they are omitted from the map.

ROYAL METEOROLOGICAL SOCIETY.

THE usual Monthly Meeting of this Society was held on Wednesday evening, February 18th, at the Institution of Civil Engineers, Mr. R. H. Scott, F.R.S., President, in the chair. Messrs. H. B. Baker, M.D., S. Dixon, R. Foster, and B. O. Meek, F.L.S., were elected Fellows of the Society. The following papers were read :—

1. "How to detect the anomalies in the annual range of temperature," by Dr. Buys Ballot, Hon. Mem. R.Met.Soc. The author shows that it is most likely that only a long continued series of observations can give evidence of an interruption of rise and fall, especially in localities where the temperature of the same day in different years may differ by 20° C. (36° F.) as at St. Petersburg.

2. "Cloud Observing," by D. W. Barker, F.R.Met.Soc. As there is a great deal of confusion amongst cloud observers, not only as to the particular names of clouds, but more especially with regard to their movements, the author recommends that there should be two simple divisions, viz., "stratiform" and "cumuliform." To the stratiform belong all the higher forms of cloud and a few of the lower ; to the latter belong the typical cumulus cloud always seen in the lower atmosphere. From the result of numerous observations, the author's conclusion is that the actual normal motion of the cirro-filum cloud is along the line of filature, and that knowing the bearing of the V or radiating point, the direction of its motion can be at once inferred. In all cases the author observed the V point first formed in the point from which the cloud is coming, but it will frequently be noticed that threads first appear parallel to a certain point on the horizon, and in all sorts of positions between this and the central V point.

3. "A suggestion for the improvement of radiation thermometers," by W. F. Stanley, F.R. Met.Soc. The author suggests that the radiation thermometer should indicate the amount of heat radiated by the sun upon a metal ball of a certain size, this being an object easy of uniform reproduction by mechanical means. For experiment, he made three hollow copper balls, which were cast with ordinary filed cores, and were of different weights. These balls were turned to exact external diameter of 1·4 in., with similar necks for the insertion of thermometers. The surfaces were oxidised by heating, to resemble the oxidation produced by the atmosphere. Into each of these balls a similar thermometer was inserted, and the neck closed round just sufficiently to keep it steady by cotton thread soaked in paraffin. The three thermometers thus enclosed in the metal balls, when exposed to sunshine and placed at 2 ins. above a piece of black board, appeared to register, under similar conditions, exactly alike. The experiments for three summer months gave from 6° to 11° difference between these instruments in the sun, and the shade temperature.

THE NEW TIME.

To the Editor of the Meteorological Magazine.

SIR,—Having read with interest your article in the January Magazine on the proposed alteration in the method of reckoning time, I trust you will give me leave to state some reasons why it appears to me that the argument on this matter is not all on one side.

In the first place, I would take exception to the assumed fact that the conference at Washington recommended such a change as you advocate. As far as I can gather, the recommendations of the conference were mainly these three, namely—

1. The universal adoption of the meridian of Greenwich as the zero of longitude.

2. The assimilation of the astronomical day to the civil day, by commencing it at midnight instead of at noon.

3. The adoption "for all purposes for which it may be found convenient" of a "universal day," which should be the Greenwich day, and the hours of which should be counted, as those of the astronomical day are at present, from 0 to 24.

I am open to information upon the point, but I have not as yet seen any report of the proceedings of the conference which would lead me to suppose that that body contemplated an interference with social usages in the matter of reckoning time; and there is, I think, some evidence to the contrary. The only reference that I find to the method of counting the hours from 0 to 24 applies to the "universal day." It would be too absurd to suppose that this "universal day" was intended to supersede the local day for civil purposes throughout the world. No one would suppose it likely or possible that the inhabitants of India or of America (for example) would be content to adopt for the ordinary purposes of life a day having no reference to their own hours of light and darkness, of noon and midnight. Moreover, the resolution of the conference provides that the "universal day" "shall not interfere with the use of local or other standard time when desirable;" and as no change was suggested (so far as appears) in the method of counting the hours of the local day, it seems to follow that the innovation now proposed cannot fairly claim the sanction of the Washington conference, and must therefore be discussed simply upon its own merits.

What then are the advantages, and what are the disadvantages, to be expected from the change?

The only definite advantage that I can find in the method of counting the hours of the local day from 0 to 24, is that persons undertaking very long journeys (perhaps, at any given time, one in ten thousand of the population) would be saved a certain small amount of trouble in settling their trains.

Against this advantage I would place two very palpable disadvantages affecting the whole community.

First, the reading of clocks and watches would be rendered greatly more difficult than at present.

Secondly, clocks striking the hours—whether public or domestic clocks—would become so intolerable a nuisance that they would of necessity be abolished.

To my mind, the division of the day of 24 hours into two periods of 12 hours each is a natural and happy device for meeting a serious inconvenience.

One word as to the "universal day." Whether the adoption of such a day would be advantageous in astronomy and in navigation is a question which may be left to be answered by the persons most interested in those pursuits. In meteorology, there may be special inquiries for which simultaneous observations are desirable, but these may be easily secured without a "universal day;" while, with regard to investigations of temperature, it is clear that observations taken at hours having no reference to the local day, would be valueless for purposes of comparison between one place and another. Even in telegraphy, the utility of the "universal day" would, I think, be quite doubtful. True, we have at present the anomaly of messages from the East arriving (so to speak) before they are sent, but I am not aware that there is any real inconvenience in this; and if the paradox should occasionally puzzle the ignorant, so much the better. Such persons will be set thinking and inquiring about the explanation, and knowledge will be increased.

GEORGE F. BURDER.

Clifton, 27th February, 1885.

[We think that Dr. Burder may rest assured that the New Time is dead and buried. We are very sorry, as in spite of the objections raised to it, all which we have carefully considered, we still hold it to be preferable to the double nomenclature. In justice to ourselves, we desire to mention that we should not have adopted either of the courses suggested by Dr. Burder. We should not have approved of altering the angular motion of clock or watch hands, but have allowed the hour hand to make two revolutions per diem as it does now, merely adding an extra ring of figures—13 to 24. Nor should we have advised any such wild scheme as letting a town clock strike 24 strokes. Any one accustomed to the Cambridge chimes of Big Ben will at once see that 13 strokes would be ample, and we should prefer a maximum of 7; variations in tone or interval would soon be learned and far less liable to error than the present plan of counting up to 12.

However, as we have already stated, we believe the scheme to be dead—strangled with red tape, and buried by the astronomers under imaginary difficulties in the use of the Nautical Almanac. But people object to getting out of ruts, and it is so reasonable and so scientific to write 9 a.m. when we mean 3 a.m.—(Put it in English, and the absurdity becomes evident, 9 a.m. = 9 hours before noon, but we mean 3 hours before noon)—that, of course, it would be a pity to give it up.

It is, however, only on a par with the remarkable periods which we call months. There are 12 of them, and there are 365 days to be appropriated to them. One would think that the obvious plan would be to take 30 as the minimum, and add 1 to nearly each alternate month. But what do we do? We give February only 28, and then having 7 to add on, we do so in such irregular order that somebody had to compose a doggrel *mem. tech.* in order to ensure their being added to the right ones. The final result is, that the early months of the year begin about $1\frac{3}{4}$ days too soon, and that instead of having months differing in length by only about 3 per cent., we have between February and its precursor and follower differences of more than 10 per cent. The muddle that this produces in much statistical work can readibly be imagined, and yet we aresure that short "February" will survive for generations happy in the company of our enemies, A.M. and P.M.—ED.]

ON THE FORMATION OF MACKEREL SKY.

BY DR. H. MUIRHEAD.

[Abstract of paper read before the British Association at Montreal].

AT the Glasgow meeting of the Association in 1876, Sir William Thomson read a short note on the formation of mackerel sky.* The author having paid much attention to the various aspects of the congeries of cloudlets so named, has come to the conclusion that the following is the usual mode in which they are generated. Given a thinnish stratum of moist air in process of passing over a drier and cooler body of air, of different velocity or direction. The vapour by cooling will become visible, and from friction the stratum will get rolled into long cylinders. Now let another current of air brush across the cylinders at right angles to their length, or indeed any large angle. This will have the effect of rolling the thinnish stratum into cylinders crossing the first set. And now neither set will appear as long continuous rollers, but from being crossed will show as a congeries of little cloudlets or drums, *i.e.*, mackerel sky.

In favour of this hypothesis it may be noted that if attention be paid to the cloudlets there will often be observed, at one or other extremity of the formation, portions of the cylinders which extend continuously for a considerable length where they have not been divided into drums by a crossing current. Again, if one of the currents moves too rapidly, some of the cloudlets will get so torn by it that they will often show as wisps or mare's tails. Moreover, it may sometimes be observed that when a long slender cloud is sailing end-long across the sky, that a portion of its length gets segmented crosswise so as to show somewhat like the rattles of a snake.

Assuming that the foregoing is the usual mode of formation of this sky from a thinnish vapour-laden stratum, if the wedge does not push inwards in increased volume, the visible vapour will gradually

* See *Met. Mag.*, Vol. XI. (1876), p. 131.

disappear, diffused in the neighbouring drier air, and fair weather probably may follow. If, however, it drive in in largely increased volume, the cloudlets will be lost in the formation of large continuous cloud—a likely harbinger of rain, as we know is often the case in such circumstances.

DRY DATES IN 1884.

To the Editor of the Meteorological Magazine.

SIR,—Mr. J. W. Scott having called attention to the "dry dates" in 1884 in his locality, it may not be uninteresting to mention that I notice a similar coincidence:—16th December ·14 is the only entry for that day; and only two for 17th, May, ·05, and July, ·10. The 6th of the month has been the wettest day, and it was on this day that the heaviest fall of the year occurred. The sum total of the falls on this day is also the largest in the year, but the 5th runs it very close.

Yours truly,

G. H. M. WHISH.

28, Addison Gardens, Kensington, W. February 21, 1885.

SIR,—Your correspondent, Mr. J. W. Scott, will perhaps be interested to learn that at Nottingham also there was an absence of rain on the 16th and 17th of the months in 1884, as shewn in the following table:—

	16th.		17th.		16th.		17th.
January ...	—	.....	·001	July	—	.....	·022
February..	—	... ..	—	August.....	—	.....	—
March.....	—	... ..	·022	September.	—	.....	—
April	·027	... ..	—	October ...	—	.....	—
May.....	—	.....	—	November..	—	.....	·008
June	·019	.....	—	December..	·230	.....	·066

I also notice that the rainfall observations here for the last 45 years shew that every tenth year has been a dry one, as will be seen from the following table:—

Year.		Rainfall at Nottingham.		Relation to mean of 45 years.
1844	.....	20·900	.....	—5·172
1854	.....	17·400	.....	—8·672
1864	.....	17·400	.....	—8·672
1874	.....	18·136	.....	—7·936
1884	.....	20·100	.....	—5·972

I am, yours truly,

FRANK RAYNER, Stud. Inst. C.E.

Nottingham, 12th March, 1885.

[With reference to the dryness of years ending with 4, see *Brit. Rain.*, 1882, p. 18.—ED.]

SCRAPS.

ARTIFICIAL BALL LIGHTNING.—An effect which bears a strong resemblance to ball lightning has been produced by M. Planté with the help of a battery of 16,000 Planté couples, giving an electromotive force of about 40,000 volts on first discharging. He prepared two pads of filter paper moistened with distilled water, and brought them very near together, with, however, a layer of air between, the whole forming an air condenser. The pads were connected to the poles of his battery or accumulators, and he then observed a small globule of fire or mimic lightning moving about between the pads, and sometimes passing from one pad to the other. When a pad became dry at any point the light appeared at some other point, but would reappear at the old place when it was moist again. The likeness to fire balls is very striking; their peculiar wandering character is imitated; and if we suppose the pads of the air condenser to represent the wet earth and a charged cloud, the analogy becomes still more remarkable. If we are not mistaken the late C. F. Varley suggested that ball lightning might be the luminous end of a discharge travelling about on the surface of the earth, and M. Planté's experiment tends to support this view.—*Engineering.*

[Mr. Varley exhibited the phenomenon, December 11th, 1872. See *Jour. Soc. Tel. Engineers*, vol. 1, p. 368.—ED.]

MANUFACTURING RAIN.—The ingenious plan for rain-making proposed by General Ruggles, of Virginia, is in accordance with a theory of rain-formation long held by eminent savans.—[? ED.] The plan is to send up into the moist strata of the atmosphere dynamite cartridges, lodged in balloons, to be exploded by time fuses, or electric wires connected with the earth. The explosion, it is claimed, will have the effect of bringing together masses of air of different temperatures and humidities, causing condensation of the vapour aloft sufficient to produce rain.

[Much has been written on this subject—for instance we remember a pamphlet with the title Cannons and Tempests. It *might* be worth while to collect the literature and examine it.—ED.]

FROZEN GROUND.—A well sunk at Yakoutsk, in Siberia, to the depth of 540ft. disclosed the fact that the ground was permanently frozen to this depth, and probably to the depth of 700 ft. The rate of increase of temperature was 1° in 52 ft.

[We cannot quite follow the argument here. The writer seems to have much understated the total depth frozen if he is correct in taking the increase at 1° in 52 ft. Jakutsk (or Yakoutsk) is probably the coldest large town in the world, and yet sometimes it is hotter there than it ever is at Barbados. Jakutsk is on the Lena in N. lat. 62° 1′, E. lon. 129° 42′ and about 500 feet above sea level. The average temperature of January is —44° F. (76° below freezing) and the average temperature for the whole year is 13°·3 F., or 18°·7 below freezing. On individual occasions the temperature has risen to 101°·8, and it once fell to —79°·6, or 111°·6 below freezing—being far below that usual to Arctic explorers. We, however, have to consider only the mean annual temperature, 13°·3; as this is 18°·7 below freezing, it is evident that if the increase is 1° for 52 ft., unfrozen ground can only occur at the depth of 972 ft., and this seems to us a more probable depth than 700 ft. The extreme heat in summer will, of course, penetrate to some little depth, but probably not more than 40 or 50 ft.—ED.]

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1884.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	86·9	4	42·2	26	74·1	54·4	55·2	75	125·0	35·7	2·46	17	6·3
Malta	94·6	19	63·2	5	83·8	68·8	65·4	70	142·6	...	·00	0	0·5
Mauritius	78·0	4	58·0	20	75·2	63·4	60·0	74	124·7	46·9	1·55	12	4·2
Calcutta	93·0	15	75·6	21	87·6	78·5	78·3	87	160·2	70·7	11·96	24	8·2
Bombay	88·3	5	74·0	26	84·4	77·0	77·2	88	138·6	71·4	25·87	28	9·4
Ceylon, Colombo	86·2	12*	75·0	7	85·2	78·2	73·2	76	140·5	65·8	2·11	11	6·3
Melbourne	64·9	9	29·9	24	55·1	39·4	40·2	79	109·0	24·5	·78	7	6·1
Adelaide	64·8	7	35·2	23	57·2	41·9	40·3	70	124·4	26·5	·51	6	5·1
Wellington	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	60·0	9	38·0	23	56·5	46·8	44·1	76	117·0	27·0	2·78	27	5·8
Jamaica, Kingston	91·6	17	72·2	29	88·8	74·1	71·8	73	...	...	·69	...	5·2
Barbados	84·0	24	70·0	26	83·0	73·0	75·3	84	144·0	...	4·21	13	5·0
Toronto	85·6	1	45·1	15	73·7	54·3	54·6	71	142·0	38·5	2·12	15	5·8
New Brunswick, Fredericton	91·0	1	40·1	27	72·8	52·9	55·4	80	...	...	7·83	17	7·3
Manitoba, Winnipeg	79·2	24	37·7	3	69·5	49·6	53·8	76	...	...	1·32	12	6·1
British Columbia, Victoria	72·0	20	43·0	9	...	...	...	...	...	...	·48	5	...

* And 14.

REMARKS, JULY, 1884.

MALTA.—Mean temp. 75°·5; mean hourly velocity of wind 8·1 miles; sea temp. rose from 74° to 83°, and then fell to 77°. The glow after sunset continued.

J. SCOLES.

Mauritius.—Rainfall 1·07 in., and mean temp. 0°·2 below average; mean hourly velocity of wind 2·4 miles below the average, prevailing direction S.E. Unusual colorations of sky before sunrise and after sunset daily, lasting 1 hr. 12 min.

C. MELDRUM, F.R.S.

Melbourne.—Mean temp. of air 1°·1, and of dew point 1°·2 below average. Rainfall 1 inch, and humidity and amount of cloud slightly below average; pressure slightly above the average. Prevailing wind N., strong on 5 days; heavy dew on 9 days; hoar frost on 9 days; ice on 4 days; fog on 7 days. R. L. J. ELLERY, F.R.S.

Adelaide.—Pressure above 30 in. throughout the month, which has only once occurred previously (in June, 1877), the mean being ·166 in. above the average; mean temp. the lowest, and total rainfall the smallest on record for July. The weather was remarkably fine, and the mean amount of cloud 13 per cent. below average.

C. TODD.

Auckland.—Weather showery throughout, and remarkable for the predominance of S.W. and W. winds; total rainfall small, fully 2 inches below average; pressure above and mean temp. below average. T. F. CHEESEMAN.

JAMAICA.—The rainfall for July was much below the average, and drought was severely felt in several places. Prevailing wind S.E. by E., mean hourly velocity 4·3 miles. MAXWELL HALL.

BARBADOS.—Pressure very unsteady and slightly below the average; mean temp. (77°) 0°·3 above average; prevailing wind N.E., mean hourly velocity 12·4 miles, extremes 18·5 miles and 7·7 miles. Rainfall 47 per cent. below average. Seven days were overcast. R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1884.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	92·0	11	45·7	26	77·1	54·5	52·2	66	125·4	38·7	·89	10	3·6
Malta	91·3	6	64·3	1	85·2	70·6	67·4	73	149·0	...	·00	0	1·0
Mauritius	78·4	12	54·1	22	74·8	62·1	57·3	70	126·4	46·9	·34	8	5·0
Calcutta	90·5	2	75·5	31	87·3	78·2	78·1	87	163·6	71·6	10·97	25	7·9
Bombay	86·7	8	75·0	11	84·6	76·8	76·7	87	143·2	72·5	15·29	28	7·6
Ceylon, Colombo	86·0	31	73·3	30	84·1	77·5	72·9	77	141·5	59·5	1·19	9	6·9
Melbourne	73·0	30	33·0	1	61·5	45·4	42·1	69	120·7	26·2	1·63	13	6·4
Adelaide	81·1	30	40·9	20	64·0	48·1	42·5	63	133·4	33·5	1·09	16	5·9
Wellington	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	64·0	28	40·0	5	57·9	48·8	45·6	75	122·0	29·0	5·69	27	7·0
Jamaica	91·1	11*a*	70·8	8	88·4	73·5	72·6	78	...	...	4·79	...	6·4
Barbados	84·0	23	70·0	16	82·0	72·0	75·5	86	144·0	...	7·35	15	6·0
Toronto	89·6	19	44·1	27	75·8	54·7	56·6	72	148·0	37·0	2·12	12	4·2
New Brunswick, Fredericton	85·7	20*b*	40·5	28	77·0	55·3	58·8	80	...	...	4·23	14	5·7
Manitoba, Winnipeg	88·1	13	36·0	23	71.8	50·6	56·4	79	...	...	6·90	15	6·7
British Columbia, Victoria	86·0	2	43·0	15	...	...	...	...	...	...	1·84	8	...

a And 18. *b* And 21.

REMARKS, AUGUST, 1884.

MALTA.—Mean temp. 77°·1; mean hourly velocity of wind 7·5 miles; sea temp. rose from 79° to 82°. L on 27th. J. SCOLES.

Mauritius.—Rainfall 1·35 in., mean temp. 0°·9, and mean hourly velocity of wind 1·8 miles below their respective averages. Prevailing wind S.E. by S. to E.S.E. Prolonged colourations of the sky before sunrise, and after sunset, but not intense. C. MELDRUM, F.R.S.

CALCUTTA.—Rainfall very deficient, especially in the central districts of Bengal, and in a large portion of Behar. J. ELIOT.

Melbourne.—Mean temp. 2°·4 above average; temp. of dew point average; humidity, pressure and rainfall all about the average. Prevailing wind N., strong on 12 days, heavy dew on 3 days, ice on 1 day, L on 3 days. R. L. J. ELLERY, F.R.S.

Adelaide.—The month was very dry, the rainfall being less than half the average; the weather, as a whole, was fine, but cloudy. During the last few days, pressure fluctuated considerably, and gales occurred on 26th and 30th; mean temp. (56°·0), 2° above the average, the max. being the highest in August since 1862. C. TODD.

Auckland.—From 1st to 9th, showery and equally with S.W. winds; heavy R on 13th and 16th; from 18th to end of month S.W. winds and frequent showers. Mean temp. above average, rainfall 1·19 in. above average. T. F. CHEESEMAN.

KINGSTON.—On 20th, 2·64 in. of R fell between 3.30 and 4.30 p.m.; in the lower part of Kingston H fell. Direction of wind S.E., mean hourly velocity 3 miles. MAXWELL HALL.

BARBADOS.—Mean temp. (76°·2) 1°·4 below average. N.E. winds prevailed on 29 days; average velocity 9·7 miles per hour, extremes 16·2 miles, and 5·5 miles, which is 18 per cent. above the average. Rainfall 6 per cent. below the average. Seven days were overcast. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·58	XI.	Rhayader, Nantgwillt..	9·15
,,	Margate, Birchington...	1·95	,,	Carno, Tybrith	6·25
,,	Littlehampton	3·59	,,	Corwen, Rhug	4·54
,,	Hailsham	4·26	,,	Port Madoc	7·52
,,	I. of W., St. Lawrence.	3·34	,,	I. of Man, Douglas	4·16
,,	Alton, Ashdell.....	4·14	XII.	Stoneykirk, Ardwell Ho.	3·01
III.	Winslow, Addington ...	2·67	,,	Melrose, Abbey Gate...	3·54
,,	Oxford, Magdalen Col...	2·67	XIII.	N. Esk Res. [Penicuick]	2·75
,,	Northampton	2·92	XIV.	Ayr, Cassillis House ...	4·35
,,	Cambridge, Beech Ho...	1·45	,,	Glasgow, Queen's Park.	3·60
,,	Wisbech, Bank House..	2·00	XV.	Islay, Gruinart School..	5·85
IV.	Southend	1·90	XVI.	St. Andrews, Newton Bk.	2·86
,,	Harlow, Sheering	2·49	,,	Balquhidder, Stronvar..	13·56
,,	Rendlesham Hall	2·17	,,	Dunkeld, Inver Braan..	5·66
,,	Diss	2·12	,,	Dalnaspidal H.R.S. ...	8·75
,,	Swaffham	2·01	XVII.	Keith H.R.S.	1·84
V.	Salisbury, Alderbury...	3·77	,,	Forres H.R.S.	2·35
,,	Warminster	4·22	XVIII.	Strome Ferry H.R.S....	8·91
,,	Calne, Compton Bassett	3·23	,,	Lochbroom	5·73
,,	Ashburton, Holne Vic..	10·11	,,	Tain, Springfield.....	2·42
,,	Holsworthy, Clawton...	4·25	,,	Loch Shiel, Glenaladale	13·08
,,	Hatherleigh, Winsford.	4·34	,,	Invergarry	10·78
,,	Lynmouth, Glenthorne.	5·59	XIX.	Lairg H.R.S.	...
,,	Probus, Lamellyn	4·99	,,	Forsinard H.R.S.	2·00
,,	Wincanton, Stowell Rec.	3·27	,,	Watten H.R.S.	2·60
,,	Wells, Westbury.....	2·69	XX.	Dunmanway, Coolkelure	10·65
VI.	Bristol, Clifton	3·35	,,	Fermoy, Gas Works ...	5·22
,,	Ross	4·50	,,	Tralee, Castlemorris ...	4·37
,,	Wem, Sansaw Hall.....	2·37	,,	Tipperary, Henry Street	5·21
,,	Cheadle, The Heath Ho.	2·55	,,	Newcastle West	2·57
,,	Worcester, Diglis Lock	2·72	,,	Miltown Malbay.....	3·75
,,	Coventry, Coundon	3·25	,,	Corofin	...
VII.	Melton, Coston	2·35	XXI.	Carlow, Browne's Hill..	3·51
,,	Ketton Hall [Stamford]	2·17	,,	Navan, Balrath	2·72
,,	Horncastle, Bucknall ...	2·30	,,	Mullingar, Belvedere ...	2·68
,,	Mansfield, St. John's St.	3·17	,,	Athlone, Twyford	4·45
VIII.	Macclesfield, The Park.	2·16	XXII.	Galway, Queen's Col....	3·09
,,	Walton-on-the-Hill.....	2·96	,,	Clifden, Kylemore	9·11
,,	Lancaster, South Road.	3·88	,,	Crossmolina, Enniscoe..	5·61
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	2·86
IX.	Wakefield, Stanley Vic.	2·00	XXIII.	Dowra	...
,,	Ripon, Mickley	2·64	,,	Rockcorry.....	3·55
,,	Scarborough.....	1·54	,,	Warrenpoint	4·79
,,	East Layton [Darlington]	1·69	,,	Newtownards	3·22
,,	Middleton, Mickleton..	2·80	,,	Belfast, New Barnsley .	4·05
X.	Haltwhistle, Unthank..	2·32	,,	Cushendun	4·16
,,	Shap, Copy Hill	12·89	,,	Bushmills	4·25
XI.	Llanfrechfa Grange	5·49	,,	Stewartstown	3·39
,,	Llandovery	5·86	,,	Buncrana	3·30
,,	Castle Malgwyn	7·00			

FEBRUARY, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·86	+ 1·22	·76	16	18	57·8	12	27·6	21	5	11
II.		Maidstone (Hunton Court)...	2·70	+ 1·08	·43	15*a*	15	...	...	...	...	...	...
,,		Strathfield Turgiss	2·56	+ ·81	·41	15*a*	18	56·1	24	23·3	20	6	14
III.		Hitchin	2·20	+ ·60	·42	16	19	53·0	12	20·0	20	11	...
,,		Banbury	3·12	+ 1·28	·54	4	17	55·0	24	23·5	21	8	...
IV.		Bury St. Edmunds (Culford)	1·98	+ ·21	·47	16	17	56·0	12	20·0	20	10	...
,,		Norwich (Cossey)	2·17	+ ·42	·44	15	14	57·5	12	24·5	21	6	9
V.		Weymouth(LangtonHerring)	3·93	...	·66	26	23	...	...	...	...	...	...
,,		Barnstaple	3·94	+ ·75	·59	1	21	60·0	25	28·0	21	...	...
,,		Bodmin	5·58	+ ·71	1·31	1	21	52·0	15*c*	26·0	21	3	9
VI.		Stroud (Upfield)	3·85	+ 1·60	·64	16*b*	18	55·0	12	25·0	20	6	...
,,		ChurchStretton(Woolstaston)	3·73	+ 1·23	·55	1	21	55·0	24	27·0	18	7	9
,,		Tenbury (Orleton)	3·92	+ 1·45	·72	21	17	60·5	24	17·8	21	8	12
VII.		Leicester	2·68	...	·71	16	16	58·5	24	22·0	21	4	17
,,		Boston	1·73	— ·05	·52	16	11	56·0	24	28·0	21	6	...
,,		Grimsby (Killingholme).....	3·03	+ 1·23	·54	16	21	55·0	24	29·0	21	4	...
,,		Hesley Hall [Tickhill].....	2·02	...	·59	16	19	60·0	24	22·0	21	8	...
VIII.		Manchester (Ardwick).....	2·50	+ ·31	·37	1	20	54·0	24	25·0	21	6	...
IX.		Wetherby (Ribston Hall) ...	1·80	— ·35	·30	4	12	...	...	...	...	...	...
,,		Skipton (Arncliffe)	6·72	+ 2·08	·94	8	22	54·0	24	19·0	19	7	...
X.		North Shields	1·00	— ·84	·58	8	13	58·0	24	23·2	19	12	13
,,		Borrowdale (Seathwaite).....	26·05	+14·60	4·62	26	21	49·2	26	22·2	20	3	...
XI.	WALES.	Cardiff (Ely).....	4·19	+ ·53	·68	26	22	...	...	...	...	...	...
,,		Haverfordwest	6·10	+ 1·65	1·35	23	19	54·0	12	23·0	18	6	10
,,		Plinlimmon (Cwmsymlog) ...	5·32	...	·58	23	21	...	...	...	...	...	...
,,		Llandudno.....	2·31	+ ·02	·50	21	20	57·2	24	29·2	21	4	...
XII.		Cargen [Dumfries]	5·42	+ 1·61	·75	2	19	50·0	25*d*	22·8	20	7	...
,,		Jedburgh (Sunnyside).....	1·94	+ ·18	·59	8	13	54·0	27	18·0	20	9	...
XIV.		Douglas Castle (Newmains)	6·07	+ 2·90	·67	2	21	...	...	...		...	...
XV.		Lochgilphead (Kilmory).....	7·41	+ 3·02	1·61	6	20	...	...	...	..	...	...
,,		Oban (Craigvarren)	7·27	...	1·70	6	23	52·0	23	26·0	17	6	...
,,		Mull (Quinish).....	8·00	...	·92	6	23	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·30	+ 1·34	·80	14	16	...	...	...	...	...	...
,,		Arbroath	2·72	+ ·56	·56	8	14	51·0	12	25·0	18	11	...
XVII.		Braemar	4·26	+ 1·59	·70	22	18	48·0	12*e*	12·0	20	14	23
,,		Aberdeen	3·56	...	·98	8	17	54·0	24	20·0	19	12	...
XVIII		Skye (Sligachan)	16·44	...	2·81	11	18	...	...	...	...	...	...
,,		Culloden	2·93	+ 1·88	...	...	...	55·0	26	14·0	20	13	26
XIX.		Dunrobin	2·05	...	·55	13	10	53·0	26	22·0	20	12	...
,,		Orkney (Sandwick)..... ..	3·63	+ 1·08	·35	6	25	50·8	24	11·1	20	9	15
XX.	IRELAND.	Cork (Blackrock)	7·35	+ 2·76	1·59	21	21	56·0	9	25·0	17*f*	...	...
,,		Dromore Castle	5·87	...	1·00	23	21	56·0	25	30·0	19	...	...
,,		Waterford (Brook Lodge) ...	5·82	...	·83	21	21	52·5	27	22·0	19	5	17
,,		Killaloe	4·70	...	·81	6	22	57·0	27	24·0	19	9	...
XXI.		Portarlington	2·35	+ ·14	·42	6	21	55·0	27	26·0	19	8	...
,,		Dublin (FitzWilliam Square)	2·81	+ ·65	·92	16	19	58·4	26	26·1	19	3	12
XXII.		Ballinasloe	3·20	+ ·69	·77	21	22	55·0	26	22·0	16*g*	14	...
XXIII		Waringstown	4·11	+ 1·86	·88	21	22	59·0	27	20·0	18	15	21
,,		Londonderry (Creggan Res.).	2·81	...	·34	26	22	...	...	...	...	...	..
,,		Omagh (Edenfel)	4·04	+ 1·76	·64	6	20	57·0	26	22·0	18	10	...

a And 16. *b* And 27. *c* And 24, 25. *d* And 27. *e* And 26. *f* And 18. *g* And 19.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON FEBRUARY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The month passed without affording facilities for early spring sowing, which seemed probable at first. Autumn-sown crops were checked. No S.

BANBURY.—Mean temp. 42°·3; high wind on 4 days, S on 2, H on 2, L on 2.

CULFORD.—The weather was somewhat unsettled; frequent showers with high winds, and some rather sharp frosts.

LANGTON HERRING.—A wet month; fogs and mists very prevalent. Mean temp. 2°·4 above the average of 13 years. Mean pressure below the average.

BODMIN.—Mean temp. 44°·4.

STROUD.—A wet month, with a few bright warm spring days; T and heavy showers on 27th; S.W. gales on 3 days.

WOOLSTASTON.—A wet month. S on 16th. Strong gale on 21st, with S and sleet. Mean temp. 40°·5.

ORLETON.—A very changeable stormy month, with frequent heavy falls of R, but S only on 16th, when the ground was covered for a few hours. Pressure low throughout the month; mean temp. about 2° above the average. There were many frosty mornings, and a few bright and warm days, but the sky was generally obscured by clouds.

KILLINGHOLME.—A seasonable month; vegetation fairly forward. Springs began to rise, but unless the rains continue, water will be scarce in the summer.

MANCHESTER.—A very unsettled month, but there was comparatively little frost. S fell on 18th, but did not remain long, and on the same date, a sharp clap of T was heard, and vivid flashes of L were seen.

WALES.

HAVERFORDWEST.—A storm of R with L, accompanied by very low pressure, and remarkably high spring-tides, ushered in February, succeeded by a fortnight of cold, frosty weather; the remainder of the month was wet and stormy, with some very cold days. As a whole the season is early. Precelly range covered with S on 4th; very stormy with L and H on 6th; tremendous gale, lasting two hours, on 8th. Primroses and daffodils in bloom at the close of the month.

LLANDUDNO.—A dull and showery month, but on the whole, mild, the mean temp. being fully 1° above the average. Though the rainfall was little above the average, there were 20 wet days, the average being only 15. The mean daily and the total range of temp. were about the average, and although there were four nights of frost, no damage was done to tender plants.

SCOTLAND.

CARGEN.—A wet and stormy month; mean temp. 40°·5, slightly above the average; mean pressure unusually low. Sunshine only 60 hours, the average being 90 hours.

JEDBURGH.—The weather was generally pleasant and mild, birds singing freely. Snowdrops in full bloom, and spring flowers generally forward. From 14th to 21st it was cold though dry. High wind, with slight S on the 21st.

OBAN.—A seasonable and stormy month, with R on most days. S on the 18th, 19th and 21st, with very heavy gale on the latter day.

ABERDEEN.—Rainfall about an inch above the average. Prevailing wind S.W., except on the 6th, when it was S.S.E. On the 21st, a violent southerly gale occurred, which continued during the night, and till afternoon of the following day; it was observed that, with one exception, all the public clocks in the town were stopped, the hands pointing between 1.30 and 2 a.m. of Sunday, the 22nd, when the wind attained its maximum force. Hoar frost on 4 days. S on 2.

CULLODEN.—Frost prevailed all through the month, and the temp. was very low. On the nights of the 16th and 18th there was a slight covering of S on the ground. Field labour nsiderably in arrear.

IRELAND.

DROMORE.—The month was rather wet, and sometimes stormy, especially about the middle of the month.

WATERFORD.—Rainfall 1·30 in. above the average of ten years. Very high tides on the 1st. Gales on 2nd, 6th and 21st. L on 2nd and 7th. H on 4th and 7th. S on 8th and 16th.

KILLALOE.—Heavy R frequent, especially at night. Mean temp. (41°·6), below the average. Severe gale on 21st.

DUBLIN.—Although the mean temp. closely corresponded with the average, the weather was very changeable, alternate periods of cold and warmth prevailing in alternate weeks. The rainfall and rainy days were both above the average, and pressure considerably below it. Mean temp. 42°·7; mean humidity 83; mean amount of cloud 5·4; prevailing winds S.S.W. and S.W. S, sleet and H on the 17th and 18th; solar halo on 12th, lunar rainbow on 21st; fog on the 15th; gales, or high winds, on several days.

WARINGSTOWN —A very wet month.

EDENFEL.—A seasonable month. S on the 18th.

EUROPE.*

IN the *Meteorological Magazine* for February, 1879, we remarked of the first volume of Stanford's Compendium (Africa):—

"It is really a condensation of nearly all the books of travels ever written, a labour so vast that it may well originally have come from Germany, but it does not read like a translation, nor has it the heaviness which the mass of information contained in it would imply. Reading it is like listening to the personal narrative of an educated man who has himself made all the journeyings "Across the Dark Country" from the fifteenth century to the present time. If the rest of the series are as interesting as is Africa, we consider that a valuable addition will have been made to English literature."

The series is now complete—Africa (1878), Central America, West Indies and South America (1878, and second edition 1882), Australasia (1879, and fourth edition 1884), Asia (1882), North America (1883), and lastly Europe (1885)—and looking through the whole we are glad to say that the high level taken in Africa has been fully maintained in all the subsequent volumes.

It is a strong statement to say that the work has no equal in the English language, but we defy anyone to quote a better description of the world and its inhabitants. And even if we dissect it and take the separate subjects of geography, geology, meteorology, anthropology, fauna and flora, we know of no work with which this series would compare unfavourably.

Take, for instance, the last volume, Europe. What is the best rainfall map of Europe? Krümmel's, of which no English reproduction existed, but it is here facing page 34, and superposed upon it are the latest and best isotherms for January and July, those given by Teisserenc de Bort in the *Annales* of the *Bureau Météor. de France.* Nor is the excellence confined to the maps, though all are good and some of them are very fine (for instance the geological map of Europe is printed in *fourteen colours*) but the text is equally good.

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* *Stanford's Compendium of Geography and Travel*, based on Hellwald's "Die Erde und ihre Volker,"—*Europe*, by F. W. Rudler, F.G.S., and Geo. G. Chisholm, B.Sc. Edited by Sir Andrew C. Ramsay, LL.D., F.R.S., with Ethnological Appendix by A. H. Keane, M.A.I. Maps and Illustrations. London: Edward Stanford. 1885.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXXI.] APRIL, 1885. [PRICE FOURPENCE, *or 5s. per ann. post free.*

A FLOATING MID-ATLANTIC METEOROLOGICAL OBSERVATORY.

INASMUCH as most of the changes in British weather are due to the passage of cyclonic systems which are traversing this quadrant of the globe from some Westerly towards some Easterly point, it is obvious, and generally recognized, that it is more difficult to forecast the weather which will occur on the West coast of Ireland than in any part of Europe.

It has never seemed to us a very wise arrangement that this forecasting should be done in the extreme *East* of the British Isles, in London, instead of at a Western centre such as Galway; but that is not the point now before us.

The great difficulty in forecasting British weather is the lack of information from the Westward. Excepting the Azores (and they are so far South as to be of little use), there is nothing but ocean West of Ireland until we reach Newfoundland.

Let us not, however, be misunderstood and said to be adverse to the establishment of regular communication with the Azores. By itself we believe that a daily telegram from the Azores would be, as we have said, "of little use" in forecasting British weather; but we think that it would be quite otherwise as regards the more Southern countries of Europe, and if obtained primarily for their benefit, should certainly be reported to our own office.

From the vast stretch of ocean between Ireland and Newfoundland there has hitherto been only one way of obtaining information, viz., that for which the credit will ever remain due to Mr. Gordon Bennett, of the *New York Herald*, and his clever meteorological assistant, Mr. Collins (who perished in the ill-fated Jeanette expedition). His plan was to combine the information of cyclonic movements on the American Continent as obtained from the Signal Office, with the meteorological data for the ocean as stated in the log books of Transatlantic steamers arriving at ports on the Eastern coast of America; he was thus able to track the cyclones after they left the

American coast, and hence infer the trajectory which they would probably follow, and their velocity in it.

Collins, as we have said, perished in the Arctic regions. Had he still been alive, we should certainly have heard some comments from him upon the fact that while Mr. Bennett was at his own cost sending the telegrams to this country, they were stated to be useless; and yet, eight years after they were commenced (the first *New York Herald* warning was sent February 14th, 1877*), we find the English Meteorological Office arranging with the American Signal Office for the transmission of telegrams (at whose cost we do not know) with precisely the object for which Mr. Bennett sent them.

All this, however, is introductory to, and justificatory of, what we are going to plead for—viz., a floating Meteorological Observatory in about Latitude 50° N. and Longitude 20° W. Of course, the first remark that will be made upon the proposal is that it is an impossibility, and the second that the idea is a very old one.

We are aware that the depth of the ocean at the above spot is about 2,000 fathoms, about $2\frac{1}{4}$ miles, and that a mooring chain of that length would be a novelty—but the days when novelties are regarded as impossibilities have surely passed. Is no encouragement to be derived from the fact that broken telegraph cables have been picked up at even greater depths, and raised to the surface. The precise locality is not, however, to be decided wholly on Meteorological considerations, Meteorologists have little chance of raising the necessary funds, and the Observatory must be also a call station for passing vessels and for those in distress, and these conditions may require a different locality.

We start afresh with some more scraps of history. The first must be very incomplete, since we cannot lay hands on any printed account. About twenty years ago an attempt was made to establish a "call station" for merchantmen entering the Channel, by placing a vessel somewhere South of the Lizard, which vessel had telegraphic connection with the main land. We believe that the vessel was not constructed specially for the work, and the connection was so often broken, that eventually the scheme was abandoned.

The idea of establishing electro-telegraphic communication with ships in shallow water is by no means given up. In the Fisheries Exhibition of 1882 there was at least one full size specimen of a connection adapted for a light-ship, and some such connection has actually been fitted to, and is working from the "Sunk" light-ship nine miles distant, to the coast at Walton-on-the-Naze.

At the Fourth Annual Exhibition of Instruments, held by the Royal Meteorological Society, March 21st, 1883, there was an exhibit thus described in the catalogue:—

"78.—Cartoon of a Vessel designed for automatically compressing and storing air by means of the waves of the sea, and for the generation of elec-

* Comptes rendus—Congrès Internationale de Météorologie.—Paris, 1879, p. 110.

tricity by means of this compressed air. The inventor considers that the vessel can be used as a telegraph ship, and is capable of being moored in 1000 fathoms of water, and connected with the shore at any distance with an electric cable.

"*Exhibited by* C. W HARDING, ASSOC. M.I.C.E."

We believe that we are correct in supplementing this by the statement that Mr. Harding had a small vessel built for experimental trial, and that it was moored off the Norfolk coast.

Lastly, but by no means least, we reprint from our excellent contemporary, the *American Meteorological Journal* for March, the article which has led us to draw special attention to the subject—one which, for the reasons stated at the beginning of our paper, is of infinitely more practical importance to us than to our American friends; for such a station would rarely be able to warn them, and on the contrary would almost always be able to help us :—

METEOROLOGICAL STATIONS IN THE ATLANTIC.

The widespread and increasing interest taken in the information furnished by the U. S. Signal Service, as shown by requests to establish signal stations throughout the country, should be met by establishing meteorological stations in the Atlantic over or near the commercial cable lines, when they would be in communication with both sides of the Atlantic.

The practicability of such stations has been demonstrated by the cable-laying steamship *Faraday*, while laying the cable between France and the United States, and, holding on to the cable, found herself in the course of a cyclone, which passed directly over the vessel without causing her to lose her hold of the cable, and which was at once reported to the European continent, the report giving wind changes and velocity with barometric changes. It is also demonstrated by the light-ship off Frying Pan Shoals, N. C., which is anchored about twenty miles from shore, where it is exposed to the severe storms that occur off the Carolina coast. The value and importance of such stations is apparent; continuous observations could be had, not otherwise accessible; storms could be traced throughout their entire course, and the observations in connection with those of the signal stations on the Atlantic coast would decrease the danger arising from sudden storms.

The steamships of the great ocean lines and others could be warned by signal of storms raging across their path; communication by means of signals could be held with vessels, and vessels reported to owners; proximity of icebergs and wrecks reported, and it might be the means of saving many lives. If but one life were saved, it would compensate for the expense of establishing and maintaining stations These stations, under control of chief signal officers of the army, and manned by observers of the Signal Service, would add valuable data to the science of meteorology. F. S. COBURN.

New River Inlet, N. C., January 25.

To this it may be added that the recording instruments recently brought out by Messrs. Richard Frères will all work on board ship, and thus we could have a floating observatory with continuously recording instruments, a gain of considerable importance.

How many years will the weather forecasters of Europe have to rely upon conjecture, owing to the non-establishment of such an observatory as above suggested?

SIXTH ANNUAL EXHIBITION OF THE ROYAL METEOROLOGICAL SOCIETY.

SUNSHINE AND RADIATION.

YEAR by year with experience accumulating as year succeeds ye the exhibitions of this Society become better organized and mo nearly perfect. We think it a great pity that they are not, l advertisement or otherwise, made more generally known, for if th were we believe that many persons would run up to town and be w rewarded by the excellence of the collections.

The special subjects this year were Sunshine Recorders and Sol and Terrestrial Radiation Thermometers. In accordance with t usual practice, a short ordinary meeting was held before the openi of the exhibition, and the President, Mr. R. H. Scott, F.R.S., read paper, giving a brief account of the various instruments and arran ments to be found in the exhibition for the purposes of recordi solar and terrestrial radiation, and the duration of sunshine both regard to its light and its heat; the last-named being obtained means of the sunshine recorders, which are now pretty genera used. He exhibited twelve monthly maps, showing the percenta proportion of hours of recorded sunshine to the hours the sun w above the horizon in the various districts of the United Kingdo He stated that the features which strike anyone on examining t maps of sunshine, (which are for the most part for the last fi summers and for the last four winters, excluding January to Mar 1885, which has not yet expired), are :—*First*, the broad fact that t extreme South-Western and Southern stations are the sunnie As has already been pointed out, Jersey is undoubtedly the m favoured of our stations in this particular. *Second*, that in the la autumn and winter Ireland is much sunnier than Great Brita Dublin having absolutely the highest percentage of possible durat of sunshine in November and December, and being only equalled Jersey in January. The Dublin instrument is not situated in t city, but at the Mountjoy Barracks, in the Phœnix Park, beyond t Vice-Regal Lodge. The North-East of Scotland is also exceptiona bright, as the station, Aberdeen, lies to leeward of the Grampia In April the line of 40 per cent. of possible duration includes Jers Cornwall, Pembrokeshire, the Isle of Man, and the whole of Irela except Armagh. The absolute maximum of the year occurs in M and the amount rises to 50 per cent. (nearly to 60 in Jersey) over t district just mentioned as enjoying 40 per cent. in April. In Ju there is a falling off, which is continued into July, and even i August in the Western Highlands. In the South of Engla however, a second maximum occurs in August, the figure for Jer rising to 50 per cent. This is mainly due to the exceptionally bri weather of August, 1884, in the Southern Counties of Engla In September Ireland shows a falling off, and the greatest degree

oudiness is in Lincolnshire. In October the Midland Counties of ngland are the worst off. In November the line of 40 per cent. ıcloses two districts ; one Dublin, already mentioned ; the other the astern Counties (Cambridge and Beccles). The absolutely highest onthly percentages in the period under consideration are in the onth of May, 1882, in which St. Anne's Head, Milford Haven, had ? per cent., while Geldeston (Beccles), Douglas (Isle of Man), and outhbourne (Bournemouth), show 61 per cent.

By the kind permission of the Institution of Civil Engineers the xhibition was held in their library, and it remained open from the 'ening of March the 18th until that of the 20th.

Among the features in the organization, which we regard as stinct improvements, we quote (1) the classification of the instruents both on the tables and in the catalogue ; (2) the (with one ıgrant exception) rejection of all duplicates ; and (3) the introduc-on of brief popular notes on the respective groups of exhibits.

The catalogue fills eight closely-printed pages, and shows no signs the rapidity with which it was written and printed. Remarkably ood as it is, there is still room for improvement, *e.g.*, what can ıyone (who did not visit the exhibition) learn from such entries as—

56. **Davis's Self-timing Anemometer,** for self-recording the current of air in mines, furnaces, &c. The indications are per second or per minute, and the use of a watch is dispensed with.
Exhibited by Messrs. JOHN DAVIS AND SON.

57. **Meteorologist's Wind Vane or Anemoscope.**
Exhibited by G. M. WHIPPLE, B.Sc., F.R.Met.Soc.

Considerations of space, of cost, and of time necessarily prevent .e catalogue being thoroughly descriptive, but we are glad to hear .at an illustrated edition of it will probably appear, and we hope .at the opportunity will be seized to add to more of the titles ferences to publications in which the objects are fully described.

The following paragraphs will give a general notion of the instruents exhibited, but there were many, especially in the miscellaneous ass, to which no reference is made. We may notice especially (38) instanley's Radiograph, a crude but very suggestive instrument, ıd the cloud photographs, which formed exhibits (74) and (75), the ıner being from the vicinity of the Lick Observatory in California, 50ft. above sea level, and the others taken by Mr. G. W. Ormerod, R.Met.Soc. at Teignmouth.

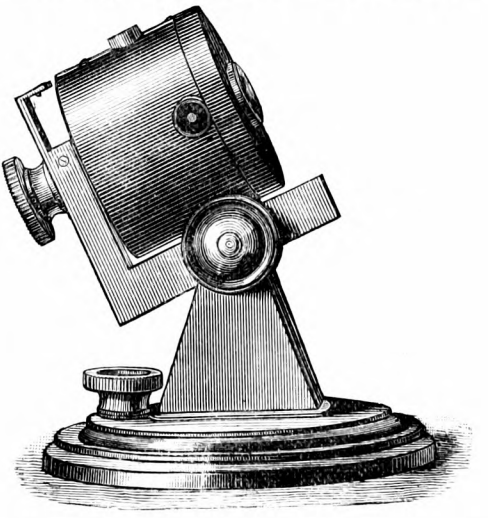
SUNSHINE RECORDERS.

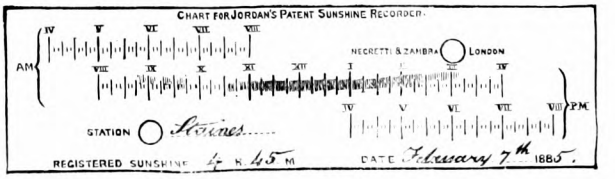
The first attempt at obtaining an instrumental record of the amount sunshine was made by Mr. J. F. Campbell, of Islay, in the year 54, when he mounted a hollow glass sphere filled with acidu-ted water in the centre of a cup of mahogany so arranged at the sun's rays were focussed on the interior of the cup and rned it. The lines of burning therefore indicated the existence of ısshine.

Solid glass spheres were substituted for the hollow ones in 1857, and cards in metal frames (1875) have replaced the wood; but in its principle the sunshine recorder of 1885 differs little from that erected on Richmond-terrace, Whitehall, thirty years ago.

Other modes of recording sunshine are based on the action of the rays of the other end of the spectrum, of the actinic, instead of the heat, rays. Among workers in this direction may be mentioned Marchand of Fécamp, Sir Henry Roscoe, and others. The most recent improvements in this direction are those by McLeod and by Jordan. In both the registration is produced by the action of a ray of sunlight on sensitized photographic (ferro-prussiate) paper. We believe that Prof. McLeod's has not advanced beyond the experimental stage—at any rate it is not yet ready for sale—and we are not sure that it ever will be, for it is much more cumbersome and complicated than Jordan's, and does not give so handy a record. However that may be, Jordan's has the advantage of being first in the field, and when to this we add that it is made by Negretti and Zambra, and sold for about one-third of the price of the "burning-recorders," (we are obliged to coin new words to distinguish the old pattern from the new "actinic-recorders") it will be understood that thoroughly well-made instruments of the new pattern are not at all costly.

The apparatus and its manipulation are extremely simple; there is a small brass box, with apertures facing E., S. and W., forming a dark chamber, which is pointed towards the South, and with its axis





adjustable according to the latitude in which it is used, and to the altitude of the Sun; this adjustment offers no difficulty, as no harm is done by opening the lid for a few seconds and looking to see that the sun's image is falling on the proper part of the printed photographic paper. The daily observation does not take five minutes, and can be made at any time between sunset and sunrise. One has merely to unclamp a screw, take the box indoors, take out the record sheet, put in a new one, and replace the box. At this very early stage the photographic papers are not quite perfect, the fainter portions of the records disappearing when, to make the record permanent, the paper is dipped in water; but this (temporary, we believe,) difficulty is easily surmounted by marking with pen or pencil the extreme limits of colouration after taking the record sheet out of the box, and before dipping it in the water.

Just as the "burning-recorders" have their faults so has this actinic one, but it gives very pretty records (as we ourselves have proved) with very slight trouble, and may fairly be described as a fascinating little apparatus.

SOLAR RADIATION THERMOMETERS.

The successive stages in the assumed perfecting of this instrument have been as follows:—An ordinary mercurial thermometer acts as a spherical mirror, and reflects the rays which fall upon it. To lessen this the bulbs were first made with black glass; moreover, originally the degree marks were put upon the supporting slab, then they were put upon the tubes of the thermometers.

It was then found that in a position where two thermometers with similarly coated bulbs were exposed to the sun, but one was exposed to more wind than the other, the indicated temperatures varied greatly. To avoid this it was proposed that the thermometer should be inserted in a glass shield exhausted of air. Various forms of mounting have been adopted, but the chief efforts have been expended in determining the influence of the amount of air left in the so-called vacuum. The next stage was, that inasmuch as black glass has a bright surface there was still much heat reflected, and therefore the surface was dulled with a coat of lamp black—so that all heat falling upon the bulb might be absorbed. Subsequently, owing to the influence of the lower temperature of the unblackened thermometer tube, about 1 in. of it was coated like the bulb.

As evidence of the degree of exhaustion, a small mercurial pressure gauge was attached to the thermometer by one firm, and by other makers platinum wires were soldered through the shield so that the stratification of the electric arc might indicate the amount of air still left in the so-called vacuum.

TERRESTRIAL RADIATION THERMOMETERS.

The pattern of minimum thermometer used for measuring terrestrial radiation has varied very little. The Rutherford minimum has

almost always been used, but its sensitiveness has gradually been increased; the spherical bulb was replaced by a cylinder, the cylinder was elongated and bifurcated, and eventually, in order to strengthen the forks, they were united into what is known as a "link."

Another plan was to flatten the cylindrical bulb into as thin a plate as possible, this giving a maximum of surface in proportion to the contents.

The bulb was also made as a double cylinder, and thus we have the so-called "bottle" pattern, and then the tube was led into the side of the bottle, and both of its ends were left open, and so we have the "open cylinder"—a remarkable specimen of glass blowing.

Then there have been two patterns of mercurial thermometers, Casella's and Negretti's.

Difficulties have arisen from the degree marks being obliterated by the weather. To guard against this, the tube has been enclosed in what is known as Leach's shield, and many attempts have been made to render the joint at the entrance of the tube water tight. This is not easy, because the thermometer is exposed to a great range of temperature, and the air inside the shield varies so much in volume that it forces its way through almost every joint. The object has, however, lately been effected by sealing the external jacket on the stem near the bulb, a feat in glass blowing formerly declared to be impossible with enamelled tubes, owing to the difference of expansion of the transparent and of the opal glass.

THE CLIMATE OF BAYONNE.*

THE Observatory of Saint Martin-de-Hinx is situated about a dozen miles inland, and slightly to the North of Bayonne, at an elevation of about 130 ft. above the sea. It is, therefore, in the extreme S.E. corner of the Bay of Biscay, and with the Cantabrian and Pyreneean ranges of mountains forming a long ridge to the south of it. The director of the Observatory, M. Carlier, is a thoroughly careful man; the station is one of M. Mascart's Second Order Stations, the results being regularly published by him in the *Annales*; and observations are made every three hours with the exception of midnight and three a.m.; besides which the Observatory is furnished with some continuously recording instruments.

For these reasons a summary of the results for twenty years from this Observatory commands attention as a valuable contribution to our knowledge of the meteorology of the S.W. of France.

We may explain, before discussing the data, that the whole pamphlet of 32 quarto pages is lithographed and copiously illustrated by diagrams. From it we have extracted some of the salient features, have converted them into English measures, and in the case of the

* *Comparaison de Vingt Années. Observations Météorologiques faites à Saint-Martin-de-Hinx, France (Landes).* Par H. CARLIER, 1er Décembre, 1864, au 30 Novembre, 1884. Bayonne, 1885. 4to.

barometer have also applied a rough correction for its altitude (131 ft.); the outcome of these operations being the two following tables, one giving monthly means and the other annual values for each of the twenty years.

Monthly values for St. Martin-de-Hinx.

	Mean Sea Level Pressure.	Mean Temp.	Mean No. of Frosts.	Mean Humidity.	Mean Amount of Cloud.	Rain.	
						Amount.	Days.
	in.	°				in.	
January ...	30·14	43·9	9	82	6·4	4·47	16
February..	30·13	46·9	5	78	6·3	3·81	15
March.....	30·02	48·9	3	76	6·4	4·21	19
April	29·98	54·2	0	76	6·6	4·81	17
May	30·02	59·5	0	75	6·0	3·74	16
June	30·09	64·2	0	77	6·1	4·72	15
July	30·09	68·2	0	77	5·4	3·16	13
August ...	30·07	68·2	0	78	5·2	2·79	12
September	30·06	64·6	0	80	5·8	5·82	14
October ..	30·04	57·1	0	82	6·4	6·34	18
November.	30·07	49·0	4	82	6·6	5·56	18
December.	30·09	42·9	11	82	6·9	5·20	17
Year ...	30·07	55·6	32	79	6·2	54·63	190

Annual values for St. Martin-de-Hinx.

	Mean temp.	Total No. of Frosts.	Prevailing wind.	Rain.	
				Amount.	Days.
	°			in.	
1864–5	57·5	20	W.N.W.	57·92	194
1865–6	56·3	32	W.N.W.	53·04	230
6–7	57·5	22	W.	48·74	219
7–8	56·6	36	N.N.W.	48·43	182
8–9	57·6	15	W.S.W.	51·69	177
1869–70	56·1	41	W.	40·68	159
1870–71	55·8	46	N.E.	52·40	191
1–2	55·9	31	W.S.W.	55·91	191
2–3	57·1	16	W.S.W.	57·87	205
3–4	56·3	51	N.N.E.	45·04	167
4–5	55·5	34	S.W.	61·02	192
5–6	53·6	53	S.S.W.	40·55	166
6–7	56·4	14	W.N.W.	58·20	204
7–8	55·2	36	S.W.	61·58	204
8–9	54·1	16	W.N.W.	75·02	213
1879–80	53·4	59	W.N.W.	53·12	165
1880–81	55·6	18	N.N.W.	48·43	199
1–2	54·1	42	N.W.	74·68	187
2–3	54·4	29	N.W.	66·05	198
3–4	54·7	31	N.N.E.	42·52	151
Mean	55·6	32	W.N.W.	54·63	190
Max.	57·6	59	—	75·02	230
Min.	53·4	15	—	40·55	151

We add a few remarks which would not go into the tables.

As regards the barometric range, it is, of course, far smaller than in England.

	St. Martin-de-Hinx.		London.		Difference.
		in.	in.		in.
Absolute Max.....	1878, Jan. 13th,	30·85 ...	30·85,	18th Feb., 1873 ...	0·00
,, Min.....	1874, April 11th,	29·01 ...	28·33,	24th Jan., 1872 ...	—·68
Extreme range.....		1·84 ...	2·52,	...	+·68

The range of temperature is large, owing to the severe frost of January, 1881, on the 16th day of which month the temperature fell to 8°·8, which was several degrees below any other instance in the twenty years. There are, however, several years in which the mean for the month of December or of January has been below 37°. The absolute maximum was 103°·5 on July 23rd, 1870. The thermometers are 6 ft. above the ground.

The rain gauge is about 5 ft. above the ground; the average fall is rather large (54·63 in.), about the same as Tavistock, Keswick or Kendal. The wettest year had an excess of 37 per cent. above the mean, and the driest year a deficiency of 26 per cent. below it, a range of 63 per cent.

The air is sometimes very dry. We notice that on July 23rd, 1870, the humidity is given as only 12, and there are several months in which it has fallen to 15 and 16.

THE CLIMATE OF MARLBOROUGH (WILTS.)

By one of those coincidences which have always a certain amount of drollery about them, we were writing the abstract of M. Carlier's twenty years' work near Bayonne when Mr. Preston's summary of twenty years' work at Marlborough* arrived. It will add to the interest of each, to treat the latter as nearly as possible in the same manner as the former, and in the same number of this Magazine.

We are compelled to make some differences, but they are not serious; we cannot give the barometer, because a change was apparently adopted about 1873–75, and while previously the values were given uncorrected for altitude, after about that period they appear to be corrected. And we cannot give the wind, inasmuch as this volume does not mention it—but a great store of useful values remains.

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* *Results of Twenty Years' Observations on Botany, Entomology, Ornithology and Meteorology taken at Marlborough College*, 1865–84. Oblong 4to 52 pages. [No name of author, printer or publisher, no place and no date].

Monthly Values for Marlborough.

	Mean Temp.	Mean No. of Frosts.	Mean Amount of Cloud.	Rain.	
				Amount.	Days.
	°			in.	
January ...	37·5	11	7·5	3·55	17
February ..	39·6	9	7·9	2·77	17
March ...	40·1	13	7·0	2·06	14
April	41·5	5	6·9	2·26	14
May... ...	50·3	3	6·5	2·15	12
June..	56·4	0	6·8	2·44	13
July..... ...	60·0	0	6·6	2·84	14
August ...	59·2	0	6·2	3·11	14
September.	55·4	0	6·5	3·54	15
October	48·0	4	7·0	3·56	17
November.	41·3	10	7·0	3·24	16
December.	38·4	12	7·4	3·02	17
Year ...	47·3	67	6·9	34·54	180

To the tabular values we may add that the highest temperature in shade was 92°·0 on August 13th, 1876, and the lowest 1° on January 5th, 1867. The maximum yearly rainfall 43·79 in. in 1882, and the least 23·41 in. in 1870, being respectively 27 per cent. above, and 33 per cent. below the mean, or a range of 60 per cent.

The humidity is not reported for each month, but for the year it is given as 85, or 6 per cent. *more* than at Bayonne, although the rainfall is one third *less*.

We have not touched upon the mass of data (unequalled to our knowledge) respecting natural history given in these tables, as we leave that subject for other journals to whose province it belongs.

THE RED SUNSETS.

A NEW way of obtaining an explanation of the above phenomena has been adopted by Mr. Warner, of the Warner Observatory, Rochester, New York, and is mentioned on pages 454, 455 of the *American Meteorological Journal*. Mr. Warner writes :—

"I will give a prize of two hundred dollars (about £42) to any person in the world who will write the best 3,000-word paper on the cause of the atmospheric effects (red light, &c.) accompanying sunset and sunrise during the past sixteen months. It is desired that these papers be as original as possible, both in facts, observation, and treatment.

"Essays must be exclusively sent prepaid to Dr. Lewis Swift, Director, Warner Observatory, Rochester, New York, must be written in English, on one side of the paper only, and must be in the simplest, untechnical phrase. Each competitor must sign a *nom de plume* to his essay, and enclose his real name and address in an envelope, superscribed with his *nom de plume*. The essays must be in Dr. Swift's hands by December 1, 1885.

"Three disinterested scientists will be selected to determine the result.

"H. H. WARNER.

"*Rochester, New York, January 17th, 1885.*"

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1884.

STATIONS. (Those in italics are south of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	81·5	18	40·6	30	68·8	52·3	53·8	82	116·6	33·6	1·77	15	5·8
Malta	90·1	26	62·2	22	81·2	67·5	64·3	73	140·3	57·6	0·54	2	2·0
Mauritius	80·5	22	57 5	29	77·0	63·8	59·4	71	130·6	49·6	1·19	15	5·1
Calcutta	89·4	17*	74·1	6	85·7	76·7	76·8	87	154·8	69·8	16·63	20	7·4
Bombay	85·8	9	73·1	27	83·3	75·7	75·8	89	143·6	71·1	17·04	26	8·0
Ceylon, Colombo	85·5	11	74·8	22	84·1	74·3	73·0	82	143·2	65·0	5·45	17	6·8
Melbourne	79·0	9	35·0	17	64·4	45·4	41·0	63	131·6	28·7	0·68	8	5·7
Adelaide	82·0	18	40·9	14	65·8	49·1	44·4	62	138·1	31·3	2·63	16	5·3
Wellington	65·0	26	34·4	15	56·6	45·3	...	...	128·0	29·0	5·86	17	..
Auckland	65·0	3	40·0	19	59·9	49·1	45·6	72	133·0	33·0	3·27	20	7·0
Jamaica, Kingston	92·7	18	71·9	10	88·7	74·0	73·2	79	...	...	3·33	...	6·5
Barbados	85·0	6†	71·0	var.	83·0	73·0	75·9	85	147·0	...	3·38	16	5·0
Toronto	85·2	10	34·9	19	71·5	51·6	55·5	77	137·0	29·5	3·19	16	5·2
New Brunswick, Fredericton	84·7	4	30·5	14‡	66·9	44·0	48·9	77	...	...	3·91	14	5·1
Manitoba, Winnipeg	70·6	1	36·7	25	59·4	43·2	46·3	82	...	...	3·75	15	5·6
British Columbia, Victoria	65·0	6	35·0	26	...	...	...	...	...	...	1·66	14	...

* And 20. † And 7, 21. ‡ And 15.

REMARKS, SEPTEMBER, 1884.

MALTA.—Mean temp. 73°·5; mean hourly velocity of wind 8·1 miles; sea temp. l from 78° to 76° by the 10th, and remained stationary to the end. TS on the 13th, on 11th and 12th. J. SCOLES.

Mauritius.—Rainfall 0·37 in., mean temp., 0°·1 and mean hourly velocity of wind miles, below their respective averages. Prevailing winds S.E. by E., to E. by S. loured skies before sunrise and after sunset throughout, but of shorter duration and s intensity than formerly. C. MELDRUM, F.R.S.

Melbourne.—Mean temp. 1° above the average; rainfall 1·65 in., temp of dewpoint 6, humidity 8, and amount of cloud ·4 below their respective averages; pressure erage. Prevailing winds N. and W., strong on 7 days; H on two days, hoar frost three, L on three. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure and temp. slightly, and rainfall and amount of cloud, nsiderably, above average. R fell as far N. as lat 28°, and well over the N.E. and W., pastoral areas and the N. agricultural districts during the latter part of the nth reviving the crops, which were looking sickly. C. TODD.

Wellington.—Fine from 4th to 11th; remainder of the month showery and settled. Rainfall 1·23 in. above average, temp. 0°·3 below it. R. B. GORE.

Auckland.—Showery and disagreeable weather throughout, but total rainfall not excess. Heavy gales on 3rd, 14th and 30th. T. F. CHEESEMAN.

Kingston.—Rainfall still below average, and distributed very irregularly over the land. In the Blue Mountain district, springs and watercourses are lower than is ever known before, and vegetation is much burnt up. Earthquake at 9.58 p.m. Sept. 6th, at Montego Bay, Mount Charles, and Windsor simultaneously. Prevailing wind S.E.; mean hourly velocity 3 miles. MAXWELL HALL.

BARBADOS.—Mean temp. (77°·1) about the average. Pressure steady; rainfall below e average. N.E. winds on 27 days, average velocity 7·1 miles per hour, extremes 3 miles and 4·2 miles. Six days overcast. TS on the 11th. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	2·34	XI.	Rhayader, Nantgwillt..	3·06
,,	Margate, Birchington...	·92	,,	Carno, Tybrith	1·58
,,	Littlehampton	2·08	,,	Corwen, Rhug	1·02
,,	Hailsham	2·32	,,	Port Madoc	4·44
,,	I. of W., St. Lawrence.	1·52	,,	I. of Man, Douglas	3·77
,,	Alton, Ashdell.....	1·94	XII.	Stoneykirk, Ardwell Ho.	3·64
III.	Winslow, Addington ...	1·19	,,	Melrose, Abbey Gate ...	1·35
,,	Oxford, Magdalen Col...	1·10	XIII.	N. Esk Res. [Penicuick]	2·00
,,	Northampton	·99	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	·80	,,	Glasgow, Queen's Park.	1·14
,,	Wisbech, Bank House..	·84	XV.	Islay, Gruinart School..	2·14
IV.	Southend	1.14	XVI.	St. Andrews, Newton Bk	2·37
,,	Harlow, Sheering	1·11	,,	Balquhidder, Stronvar..	5·66
,,	Rendlesham Hall	1·01	,,	Dunkeld, Inver Braan..	1·88
,,	Diss	1·14	,,	Dalnaspidal H.R.S. ...	3·86
,,	Swaffham	1·28	XVII.	Keith H.R.S.	2·45
V.	Salisbury, Alderbury...	1·47	,,	Forres H.R.S.	1·63
,,	Warminster	1·16	XVIII.	Strome Ferry H.R.S....	5·10
,,	Calne, Compton Bassett	1·29	,,	Lochbroom	4·49
,,	Ashburton, Holne Vic..	2·82	,,	Tain, Springfield.....	1·43
,,	Holsworthy, Clawton...	1·72	,,	Loch Shiel, Glenaladale	9·31
,,	Hatherleigh, Winsford.	2·53	,,	Invergarry	5·26
,,	Lynmouth, Glenthorne.	1·29	XIX.	Lairg H.R.S.	1·65
,,	Probus, Lamellyn	1·96	,,	Forsinard H.R.S.	2·14
,,	Wincanton, Stowell Rec.	1·42	,,	Watten H.R.S.	1·71
,,	Wells, Westbury.....	1·14	XX.	Dunmanway, Coolkelure	4·56
VI.	Bristol, Clifton	1·22	,,	Fermoy, Gas Works ...	2·85
,,	Ross	1·44	,,	Tralee, Castlemorris ...	2·62
,,	Wem, Sansaw Hall.....	·99	,,	Tipperary, Henry Street	3·11
,,	Cheadle, The Heath Ho.	1·60	,,	Newcastle West	1·12
,,	Worcester, Diglis Lock	1·13	,,	Miltown Malbay.....	3·46
,,	Coventry, Coundon	1·11	,,	Corofin	...
VII.	Melton, Coston	·79	XXI.	Carlow, Browne's Hill..	2·04
,,	Ketton Hall [Stamford]	1·22	,,	Navan, Balrath	1·29
,,	Horncastle, Bucknall ...	·96	,,	Mullingar, Belvedere ...	2·54
,,	Mansfield, St. John's St.	1·42	,,	Athlone, Twyford	3·22
VIII.	Macclesfield, The Park.	2·26	XXII.	Galway, Queen's Col....	1·66
,,	Walton-on-the-Hill.....	2·13	,,	Clifden, Kylemore	10·22
,,	Lancaster, South Road.	3·57	,,	Crossmolina, Enniscoe..	4·40
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	1·83
IX.	Wakefield, Stanley Vic.	1·16	XXIII.	Dowra	...
,,	Ripon, Mickley	2·20	,,	Rockcorry.....	...
,,	Scarborough.....	1·52	,,	Warrenpoint	3·18
,,	East Layton [Darlington]	2·07	,,	Newtownards	2·11
,,	Middleton, Mickleton..	1·77	,,	Belfast, New Barnsley .	3·27
X.	Haltwhistle, Unthank..	2·34	,,	Cushendun	3·84
,,	Shap, Copy Hill	4·88	,,	Bushmills	1·82
XI.	Llanfrechfa Grange	1·89	,,	Stewartstown	1·74
,,	Llandovery	1·75	,,	Buncrana	2·52
,,	Castle Malgwyn	2·31			

MARCH, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·65	+ ·04	·74	21	7	62·6	20	26·5	8	12	24
II.		Maidstone (Hunton Court)...	1·39	— ·19	·59	22	6	...	...	...	...	...	...
,,		Strathfield Turgiss	1·97	+ ·57	·76	22	11	62·2	20	21·9	9	15	24
III.		Hitchin	1·12	— ·36	·48	3	6	58·0	29	25·0	1*a*	22	...
,,		Banbury	·92	— ·68	·36	3	9	57·0	20	24·0	8	15	...
IV.		Bury St. Edmunds (Culford)	1·10	— ·46	·49	3	11	58·0	20	23·0	30	22	...
,,		Norwich (Cossey)	1·29	— ·40	·51	3	13	56·5	20	24·0	22	17	24
V.		Weymouth(LangtonHerring)	1·49	...	·61	3	11	...	...	...	...	...	...
,,		Barnstaple.....	1·92	— ·57	·42	21	13	54·0	5	28·0	8	...	...
,,		Bodmin	2·57	— 59	·54	2	14	52·0	3*b*	30·0	var.	6	18
VI.		Stroud (Upfield)	1·26	— ·55	·44	21	12	58·0	4*c*	26·0	7	10	...
,,		ChurchStretton(Woolstaston)	1·36	— ·80	·28	29	16	54·0	17	26·5	10*d*	15	21
,,		Tenbury (Orleton)	1·28	— ·59	33	21	14	57·0	20	24·3	8	16	18
VII.		Leicester	1·14	...	·18	3	16	56·2	17	26·2	15	12	27
,,		Boston	·83	— ·46	·38	3	7	55·0	15	29·0	22	11	...
,,		Grimsby (Killingholme).....	1·83	+ ·17	·44	5	14	53·5	20	30·0	7*e*	5	...
,,		Hesley Hall [Tickhill].....	1·07	...	·31	3	14	55·0	28	25·0	2	16	...
VIII.		Manchester (Ardwick).....	2 25	— ·20	·43	3	15	51·0	4*g*	29·0	7*i*	14	...
IX.		Wetherby (Ribston Hall) ...	1·59	— ·54	·42	4	6	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·91	+ ·15	1·01	31	15	53·0	14	25·0	14	17	...
X.		North Shields	2·22	+ ·77	·43	4	14	56·8	20	26·0	31	17	18
,,		Borrowdale (Seathwaite).....	14·86	+ 4·97	2·90	31	19	52·9	13	25·5	22	5	...
XI.	WALES.	Cardiff (Ely)..	2·17	— ·52	·60	29	11	...	...	...	...	...	...
,,		Haverfordwest	3·39	+ ·20	1·00	31	12	53·0	3*f*	24·5	7	14	19
,,		Plinlimmon (Cwmsymlog) ...	3·20	...	·70	31	12	...	...	...	...	...	...
,,		Llandudno.....	1·88	·00	·28	20	12	55·6	26	31·0	7	3	...
XII.		Cargen [Dumfries]	2·26	— ·52	·56	31	11	52·0	14*f*	25·0	1*g*	16	...
,,		Jedburgh (Sunnyside)..... ...	1·34	— ·23	·52	29	8	53·0	14*h*	23·0	23	17	...
XIV.		Douglas Castle (Newmains)	2·73	— ·41	·89	31	10	...	...	...	..	...	...
XV.		Lochgilphead (Kilmory)	4·00	— ·61	·82	28	16	...	...	...	...	...	...
,,		Oban (Craigvarren)	3·64	...	1·18	31	12	54·0	13	27·0	9	5	...
,,		Mull (Quinish).....	3·73	...	·89	31	16	...	...	...	...	...	...
XVI.	SCOTLAND.	Loch Leven Sluices	2·90	+ ·78	·80	4	9	...	...	...	...	...	...
,,		Arbroath	2·02	+ ·39	·73	29	7	52·0	20	27·0	23	10	...
XVII.		Braemar	1·74	— 45	·33	28	18	49·8	13	21·0	23	25	31
,,		Aberdeen	1·57	...	·45	29	21	53·0	13*j*	27·0	20	12	...
XVIII		Skye (Sligachan)	...	...	...	...	...	..	...	...	...	...	...
,,		Culloden	1·31	— ·44	...	...	...	55·0	26	26·3	23	10	24
XIX.		Dunrobin	2·27	...	·72	17	15	53·0	23	23·0	9	12	...
,,		Orkney (Sandwick)	2·63	— ·01	·40	31	23	48·6	21	26·4	21	6	15
XX.	IRELAND.	Cork (Blackrock)	3·50	+ ·74	1·08	2	12	60·0	26	27·0	30	13	...
,,		Dromore Castle	3·40	...	·70	31	12	57·0	27	29·0	15	...	...
,,		Waterford (Brook Lodge) ...	3·15	...	·84	28	13	56·5	20	23·0	7	14	26
,,		Killaloe	2·29	...	·80	31	13	53·0	23	27·0	10*h*	15	...
XXI.		Portarlington	1·79	— ·37	·55	28	20	44·0	3	26·5	11	13	...
,,		Dublin (FitzWilliam Square)	1·53	— ·20	·31	3	13	58·6	26	29·0	12*h*	10	20
XXII.		Ballinasloe	2·07	·31	·52	28*g*	17	52·0	26	22·0	10	18	...
XXIII		Waringstown	2·00	— ·06	·60	28	13	57·0	26	22·0	9*h*	17	23
,,		Londonderry (Creggan Res.).	2·60	...	·57	28	21	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·18	+ ·09	·60	31	17	50·0	26	26·0	11	14	...

And 6, 9, 11. *b* And 20, 31. *c* And 5. *d* And 19. *e* And 22, 28. *f* And 20. *g* And 31. *h* And 15. *i* And 10, 12, 19. *j* And 14, 17, 20.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON MARCH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—A splendid month for agricultural purposes, tillage and seeding most favorably completed. The frosts at night imposed a healthy check on vegetation, and prevented too early opening of fruit bloom. Nettle tortoiseshell butterfly seen flying on 27th; frog spawn seen on 16th, marsh marigold in flower on the 9th, broom on 20th, plum on 25th.

BANBURY.—A favourable month for agricultural operations; hawthorn buds which were showing at the end of February had not fully expanded at the close of March. Mean temp. 39°·6. Mean amount of cloud at 9 a.m. 5·6. S on 3 days, high wind on 2, fog on 1, distant T on 24th.

CULFORD. A fine dry month, with cold winds and frequent sharp frosts which checked vegetation. Fruit prospect good.

LANGTON HERRING.—A dry cold month, favourable for farming operations. With the exception of March 1883 this was the coldest March for 14 years. Mean pressure above average. Solar halo on the 5th.

BODMIN.—A fine seasonable month. Mean temp. 41°·4, the lowest recorded for 36 years.

STROUD.—A fine dry month, with cold winds; S on 4th and 21st; H and sleet on 18th.

WOLSTASTON.—A cold month with sharp frosts at night during the greater part. S on 5th and 21st. Mean temp. 39°·5.

ORLETON.—Although frosty nights and fine days prevailed during the greater part of the month, the mean temp. was only 0°·5 below the average of 24 years. Pressure high and generally steady, although there were frequent gales of wind. A fall of S occurred on the night of the 21st, covering the ground to the depth of nearly 3 inches, but it soon disappeared on the 22nd. The land was in a very favourable state for the planting of spring crops. Prevailing winds N. and E.

KILLINGHOLME.—A cold month with no gales, dry after the first week. The ground was well pulverised for sowing. but R was wanted for the seed to germinate and for the pastures Vegetation backward.

MANCHESTER.—On the whole a fine seasonable month, with many cold and frosty nights keeping back vegetation, and making spring more hopeful, for in this district a late spring is always the best.

WALES.

HAVERFORDWEST.—The first four days of the month were gloomy, cold and wet, after which the weather became fine and clear, with sharp night frosts and keen N.E. winds up to the 16th; the weather then became changeable, but was still very cold with frosty nights, and the month ended stormy, boisterous, and cold. Prevailing winds E.N.E. and S.E. Mean temp somewhat below the average; pressure high about the middle of the month. Scarcely any primroses, and grass lands very bare.

LLANDUDNO. - On the whole a fine month for March, with mean temp. rather more than 1° below the average. There were many fine bright days, and, with the exception of the 17th, 18th and 29th, there was no very stormy weather. Range of temp. about the average.

SCOTLAND.

CARGEN.—Strong winds prevailed at the commencement and towards the end of the month. Mean temp (39°·0), 2°·2 below the average; pressure 0·222 in. above the average.

JEDBURGH.—The weather was dry, with remarkably cold winds, causing the finest seed-time for many years. Vegetation much retarded, and spring flowers much affected by frost. S on the 4th, 18th and 29th.

OBAN.—The month was unusually dry, with low temp. The latter part of the month was somewhat disturbed by moderate gales on the 16th, 20th, 26th,

28th and 31st; the last being the worst, and producing a very heavy rainfall S on 21st, H on 31st.

QUINISH.—From the 1st to the 15th very fine, with occasional slight frost; thereafter cold, stormy, and unsettled.

ABERDEEN.—Altogether the weather was dry and open during the month. Rainfall about half-an-inch below the average. Aurora was observed on the nights of the 15th and 16th, after which the weather became squally, and the remainder of the month was unsettled. Lunar corona on the 23rd, H on two days, S on three, sleet on four, hoar-frost once.

CULLODEN.—The weather was dry, cold and ungenial throughout the month. From the commencement to the 24th very little R fell, and frost generally prevailed; no sign of vegetation at the close of the month.

IRELAND.

DROMORE.—The month on the whole was very fine, in fact one of the best Marches for some years.

WATERFORD.—Rainfall slightly above the average; S on 17th; H on 8th; fog on 26th.

KILLALOE.—A very favourable month for spring operations. Mean temp. (40°·9) below the average with many night frosts. The weather at the close of the month was very wintry and severe.

DUBLIN.—A cold, generally dry month. Searching "polar" winds prevailed to a large extent. The mean temp. (40°·7) was 2°·0 below the average. Rainfall and number of rainy days below the average. Mean humidity 82; mean amount of cloud 5·6; prevailing winds W., N.N.E., and N.W. S on 18th; sleet on 10th and 29th; H on 6th, 8th, and 18th; solar halo on 31st; aurora on the 15th; fog on several days.

EDENFEL.—The temp. of the month was low, with frost more or less keen on 14 nights. The greater part of the R fell on the first day, and in the last week, and during the intervening period 13 days were bright, cloudless and cold. Vegetation very backward. S on the 18th.

THE NEW TIME.

To the Editor of the Meteorological Magazine.

SIR,—Is it not premature to come to the conclusion that the New Time is dead and buried? There is a good article on the subject in *The Observatory* for March, written by the Editors, which contains a different opinion, and considers that, so far as astronomy is concerned, the change of reckoning time may suitably be made at a not very distant date. I entirely agree with this article, excepting the writers' suggestion (if I understand it aright) that the general public should make the change at an earlier date than astronomers, in order that the latter might know they were not inconveniencing themselves uselessly. I do not wish unduly to discourage others from making the change before astronomers make it, though I consider it would be more convenient for all to make the change simultaneously. This especially refers to meteorologists and astronomers, as the two sciences so closely touch each other.

So great an authority as Professor Newcomb holds that the change, if made at all, should take place at the commencement of the next century. If that occur, the present reckoning of time would not "survive for generations," as you fear it will. It appears, however, that the final Report of the Prime Meridian Conference has not yet been received, and that therefore the attempt to make the change now is altogether too hasty.

Sunderland, April 4, 1885. T. W. BACKHOUSE.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

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RAINFALL IN MADAGASCAR.

The insertion of the following table is due to a train of circumstances so circuitous as to be worthy of record as an illustration of the difficulty which arises from the absence of well-recognised centres of knowledge.

The representatives of the London Missionary Society issue yearly from the native press of Antananarivo a remarkably well-printed 8vo volume, of about 150 pages, *The Antananarivo Annual and Madagascar Magazine*, a record of information on the topography and natural productions of Madagascar, and the customs, traditions, language, and religious beliefs of its people. The eighth volume, that issued Christmas, 1884, came into the hands of Prof. Michael Foster, Sec. R.S., who wrote a very favourable notice of it, which appeared in a recent number of *Nature*. In this, Prof. Foster mentioned that the volume contained a table of rainfall. Dr. Hann read the review in *Nature*, and wrote to us to suggest that as it was impossible to get a copy of the *Antananarivo Annual* in Vienna, it would be well to reprint the table. We sent Dr. Hann's suggestion to the Secretary of the London Missionary Society, and he has favoured us with a copy of the annual, whence we reprint the article.

The story, however, is not yet ended. It will be seen that Mr. Richardson stated that the early part of 1881 was copied from the records published by the Jesuit Fathers. This started us on a fresh track, as it seemed likely that not only were there two records in Madagascar during recent years, but also that the record of the Jesuit Fathers might go back before 1881. We therefore wrote to the Rev. S. J. Perry, S.J., F.R.S., asking his help. He has no copy himself, and on writing to the French agent of the Jesuit Fathers he says that he fears that the war has destroyed all chance of obtaining information, but that he has written to Taramave to see what can be done :—

RAINFALL OF ANTANANARIVO FOR FOUR YEARS.

In order to present our readers with a full record of nearly four years, I have taken the amounts from January to September of 1881

from the record published by the Jesuit Fathers, my own observations having commenced in October of that year. I leave the readers to make their own comparisons. It will be noticed that the fall for the present year has been the heaviest of the four.*

Month.	1881.	1882.	1883.	1884.	Average 4 Years.	True Average.
	in.	in.	in.	in.	in.	in.
January ...	12·98	(23) 12·50	(30) 16·86	(25) 11·91	13·56	13·56
February ..	4·57	(11) 6·95	(16) 7·12	(22) 12·48	7·78	7·78
March	9·50	(16) 4·01	(19) 9·04	(23) 11·54	8·53	8·52
April	1·74	(6) 0·63	(4) 0·88	(7) 2·39	1·41	1·41
May	0·20	(4) 0·58	(4) 1·59	(3) 1·23	0·90	·90
June	0·60	(0) 0·0	(1) 0·33	(?) 0·06	0·11	·25
July.....	0·70	(0) 0·0	(5) 0·21	(1) 0·02	0·075	·23
August ...	0·10	(0) 0·0	(1) 1·07	(1) 0·12	0·32	·32
September.	0·20	(0) 0·0	(0) 0·0	(7) 1·42	0·405	·41
October ..	(3) 1·97	(4) 1·72	(9) 6·38	(15) 6·66	4·70	4·18
November.	(6) 2·45	(11) 7·60	(12) 6·07	(13) 6·82	5·735	5·74
December .	(13) 7·11	(15) 7·09	(15) 9·12	(24) 14·21	9·38	9·38
Total	42·12	(90) 41·08	(116) 58·67	(143) 68·86	52·31	52·68

The rainy season began on October 2nd, 1882, and 1883, and a heavy storm passed over the capital on October 1 (Leap-Year), 1884, when we had ·98 in. in less than 20 minutes; and on October 27th we had 2·25 in. in much less than half an hour.

The figures in brackets give the number of days on which rain fell.

J. Richardson.

Faravohitra, Jan. 1st, 1885.

NOTES ON THE WEATHER OF A CENTURY AGO.

By Charles Tomlinson, F.R.S.

Having had occasion recently to refer to the letters of the poet Cowper, I was struck with his frequent remarks on the weather. It may be some consolation to those persons who imagine that our climate has deteriorated, to find that the poet complained of cold and wet summers, unseasonable springs and winters, pretty much as we do. I am writing these remarks on the 8th of May, by the side of a blazing fire, hail having just whitened the streets, and snow was reported yesterday from Kent. This cold weather is attributed to a multitude of icebergs which have been launched from their Arctic home into the Atlantic, and have converted the "ethereal mildness"

* The author or the printer has gone astray in the last column, which in two or three months will not at all agree with the previous ones. We have, therefore, re-worked the averages, assuming the monthly amounts (which agree with the yearly totals) to be correct. The differences are not essential, but we cannot pass them without notice.

of our April into a wintry May. Cowper makes the same complaint about icebergs, and suggests that they should be furnished with sails, for the purpose of wafting them down to Equatorial regions; but he was not aware that about seven-eighths of the mass of an iceberg is below the surface of the water, so that our puny efforts would be exerted in vain to remove these tremendous masses.

Our poet records a violent storm on the 9th of May, 1780, during which he watched a crow struggling hard to retain its seat in its nest on the top of a tall tree.

1781. In May of this year, he says that his poems were written during the winter, "Hence it comes to pass that the season of the year which generally pinches off the flowers of poetry unfolds mine, such as they are, and crowns me with a winter garland. In this respect, therefore, I and my contemporary bards are by no means on a par. They write when the delightful influence of fine weather, fine prospects, and the brisk motion of the animal spirits make poetry almost the language of nature; and I, when icicles depend from all the leaves of the Parnassian laurel, and when a reasonable man would as little expect to succeed in verse as to hear a blackbird whistle." On June 5th, 1781, he writes:—"These seasonable showers have poured floods upon all the neighbouring parishes, but have passed us by. My garden languishes, and what is worse, the fields too languish, and the upland grass is burnt."

1782. On the 2nd of February, he says:—"No winter since we knew Olney has kept us more confined than the present. We have not more than three times escaped into the fields since last autumn." In August of the same year he is troubled with floods.

1783. On February 13th, he refreshed himself with a walk in the garden, "where I find that January (who according to Chaucer was the husband of May) being dead, February has married the widow." On June 13th, 1783, he writes:—"We have had more thunderstorms than have consisted well with the peace of the fearful maidens in Olney * * Yesterday morning, at seven o'clock, two fire-balls burst either in the steeple or close to it. William Andrews saw them meet at that point, and immediately after saw such a smoke issue from the apertures in the steeple as soon rendered it invisible. The noise of the explosion surpassed all the noises I ever heard; you would have thought that a thousand sledge-hammers were battering great stones to powder, all in the same instant. The weather is still as hot, and the air as full of vapour as if there had been neither rain nor thunder all the summer." On the 19th he writes:—"The summer is passing away, and hitherto has hardly been seen or felt. Perpetual clouds intercept the influence of the sun, and for the most part there is an autumnal coldness in the weather, though we are almost upon the eve of the longest day." On September 29th he refers to "the ill effects of this unhealthy season."

1784. February 22nd. He expresses congratulations on the thaw, and complains of the frost having frozen the ink in his ink-

stand. The frost had lasted nine weeks. On July 5th he says that during the whole month of June "we have experienced almost the rigours of winter."

1788. March 19th. "The spring is come, but not I suppose that spring that our poets have celebrated. So I judge at least, by the extreme severity of the season, sunless skies and freezing blasts surpassing all we experienced in the depth of winter." May 6th. "What constitution or what skin can possibly be proof against our vernal breezes in England?" June 17th. "The east and north-east winds breathe winter upon the roses of June." In September he complains that our summers are hardly ever warm or cold enough. "Were they warmer we should not want a fire, and were they colder we should have one."

1792. June 19th. He speaks of the "ice-islands (that is, ice-bergs) that spoil all our summers," to which we have alluded in the beginning of this article.

A FLOATING MID-ATLANTIC METEOROLOGICAL OBSERVATORY.

The following extract from the Signal Office *Monthly Weather Review* for January, 1885, is of interest, as almost completely confirming the remarks on page 34 of our last number :—

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings in New York and Philadelphia, and in the Custom House at Boston, where the necessary blanks and other information will be furnished to shipmasters.

The following circular explains the object of these agencies :—

UNITED STATES OF AMERICA,
SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, November 29th, 1884.

SHIPMASTERS.—It is now generally known that a large percentage of *American storms* travel across the Atlantic, and in a few days after leaving our coast affect the *weather conditions of Europe.* Shipmasters' observations prove this, and Captain Henry Toynbee, Marine Superintendent of Great Britain, who has investigated the subject with much vigor, says : "E.N.E., thirty to forty miles an hour, has been adopted as a rough estimate of the track and speed of storms crossing the Atlantic, until they arrive off the west coasts, when they are affected by the disposition of pressure over western Europe."

How important it is, then, for the shipmaster about to sail to America from European ports to know the *probable weather conditions* he is likely to have on his westward passage, or where he will be likely to encounter a *storm or hurricane at sea.*

The London Meteorological Office will now make an earnest effort to make such predictions, and, in connection therewith, *the United States Signal Service,* at the solicitation of *the Meteorological Council of Great Britain.* has accepted an invitation to lend assistance in this important movement to benefit the *commerce of the whole world,* and will collect meteorological information from ship-

masters arriving in New York and Boston, and cable the same to the London Meteorological Office. From this point bulletins and warnings will be issued and telegraphed in times of great danger to all *European seaports*.

* * * * * *

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. & Bvt. Major-General
Chief Signal Office U.S.A.

In pursuance of the arrangements made with the Meteorological Office of London, England, there have been cabled to that office from New York twelve reports of storms encountered by vessels on the Atlantic, west of the forty-fifth meridian. Three messages were sent from Boston.

We have also been favoured with the following letter from Mr. Harding, with reference to the remarks at the bottom of page 34 of this vol. of the Magazine. Mr. Harding also sent a reprint of the specification of his patent (1882, August 10, No. 3827), from which we extract a paragraph which shows how thoroughly he thought out the subject more than two years ago. It contains also appreciatory notices by Prof. Buys Ballot and others :—

To the Editor of the Meteorological Magazine.

SIR,—I thank you for a copy of your paper.

I have a patent for a vessel which could be used as a Floating Telegraph Ship for the Mid-Atlantic, to be moored in the usual track of the cyclones approaching these islands.

I used a vessel of the shape shown by the enclosed plan [almost exactly that of a magnifying glass,—ED.] for years for watching a large Fishery I hire in the Wash, covering a length of foreshore of upwards of 11 miles.

The vessel was used by water bailiffs to live on board and watch the beds, where no vessel riding to her anchor and swinging with each tide could possibly live. From the form of the bottom of this vessel the waves were deflected *under* her, and she rode like a basin on the water, and is capable of being moored with four anchors and cables, one to each point of the compass; by this means she can be moored in one fixed spot.

The vessel is now very old and rusted through, and lies on the shingle beach at Snettisham, Norfolk She would ride out the heaviest gales with ease.

A vessel her shape, 500 to 1000 feet in diameter, would be capable of riding in the Mid-Atlantic in any weather, and being connected with the shore by an electric cable.

It is a matter which might pay an enormous profit, as in addition to being used by the Government for Meteorological purposes, it could be used as an ocean telegraph station, and also as a port of call.

It is a matter the Government ought to take up, or a public company.

No other vessel could be moored in *one* fixed spot without swinging, which would very shortly break the insulation of the electric cable.

I place buoys every 50 or 100 fathoms along the four riding cables, so that there is no more pressure on the vessel from the enormous length of steel wire cable to say to 2000 fathoms depth than a vessel riding in a bay in 40 or 50 fathoms, as the cable is self-buoyant.

Yours truly,

C. W. HARDING.

The Chase, King's Lynn, April 25th, 1885.

The following paragraph occurs in the specification :—

"I claim as my invention * * * * Fifteenthly, the use of my vessel as a Telegraph Station, or ship, capable of being moored in deep water, and it could also be moored in the Mid-Atlantic, from which telegraphic messages could be transmitted to shore, giving forecasts of the weather and other matters of meteorological importance, connected with cyclonic and storm disturbances, for which purpose it could be placed in any part of the sea or ocean.

"When the vessel is placed, say in a thousand fathoms of water, I propose to use steel wire ropes as cables or hawsers for mooring, with rings spliced into the cable at convenient distances, and to each of these rings I attach a buoy or air tight vessel, having buoyancy to sustain a relative portion of the dead weight of the cable as shown in Fig. 5, and round one or more of such cables I wind an insulated wire for the transmission of telegraphic messages to the shore."

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—It is a well-known presage of storm, and oftentimes of general weather, especially on our Atlantic coasts, to note the action of the tides above or below the normal, on the approach of cyclones, or on the prevalence of certain constant winds.

In the extreme islands off the west coast of Scotland, this action has been for generations the never-failing barometer of the inhabitants, who are at once excellent and daring seamen, and well known, from their constant experience of storms, to be accurate forecasters of bad weather. With them the study is oftentimes one of life and death, and they rely in a marked manner on their observance of the tidal levels from day to day throughout winter. Amongst them it is a well-established fact that the waters of the Atlantic rise abnormally high for 48 hours and downwards, before the arrival of a cyclone, the height and time period varying with the force of the approaching disturbance. Indeed, so well is this axiom established, that according to the speed of the rise, or the attainment of high water before the normal time, or the retardation of low water under the same circumstances, they can determine whether the approaching disturbance is of a first or second class order, and frequently its direction, whether central or skirting their meridian. The most marked action is of course after a period of calm weather, but even in the midst of passing storms the maintenance of the tidal level at an abnormal height is a certain indication of continued gales, or shortly recurrent disturbances, and similarly the decadence of the tide levels is a sign of northerly or easterly winds of a constant nature, which in these districts is a sure indication of fair weather.

Here, therefore, nature supplies us with an instrument of her own which, if properly studied in a few well chosen positions on the west coasts of Ireland and Scotland, will provide us with information which will go far to correspond with the results of an observer's station 1000 miles westward of our coasts.

If the daily records of the tides at these stations were faithfully recorded, and compared with the normal levels, and with periods of flow and ebb, as the rainfall is now so admirably collected by yourself, I venture to believe that very valuable data for forecasting would soon be established with greater certainty than by the barometrical gradient system now prevailing, and we should have the assistance of unerring data in determining results.

Of course where there are self-recording tidal gauges the work is more than half done already, and known data can be at once established for every month in the year.

Yours faithfully,

G. W. BRENAN, C.E.

Oban.

THE STAMFORD MERCURY.

To the Editor of the Meteorological Magazine.

SIR,—I shall be very grateful to any reader of *The Meteorological Magazine*, who can put us in the way of obtaining a record of meteorological observations taken in 1763, by the Rev. Caleb Parnham, rector of Ulford, near Stamford, in that year. The observations were recorded, I believe, in *The Lincoln, Rutland and Stamford Mercury* (commonly called *The Stamford Mercury*), in 1763, a file of which has not been kept in the office of that paper."—

Yours truly,

FRED. COVENTRY.

Ketton, Stamford, May 8, 1885.

[This is not the first time that inconvenience has arisen from the absence of a file of its own issues at the *Stamford Mercury* office. The journal is one of the oldest, if not the oldest in the British Isles having been published every week for 190 years! Possibly the proprietors *have* tried to escape from the unenviable if not unique position in which their predecessors have left them, but our impression is that their efforts towards obtaining a series of the early years have not been very heroic. There are, we believe, many years in the British Museum Library, but we do not know whether 1763 is among them. Some years back the sets of newspapers in the British Museum were very incomplete—it seemed as if they were regarded as useless lumber rather than as splendid materials for future history.—ED.]

ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

To the Editor of the Meteorological Magazine.

SIR,—Last Monday, April 20th, the air appeared to be unusually dry for this time of the year, and in order to test this the following observations were made. The temperature of the wet bulb has been given, but no use of it has been made in determining the relative humidity. During the time that the observations were taken (0.15 to 0.30 p.m.) there was no cloud, and the dry and wet bulb thermometers remained remarkably steady. The averages were 69°·2 for the dry bulb, 54°·9 for the wet. The dew point, taken at the same time by my hygrometer (with iced water and salt), was, on the contrary, most erratic, and its temperature varied with every puff of wind from 28° to 36°; this makes the relative humidity at the time to vary from 21 to 30 per cent. The air does not often attain to this degree of dryness; on the other hand it is not unprecedented. I find on referring to my journals that on July 1st, 1881, at 3.30 p.m., the dry bulb was 75°, the wet bulb 54°·2, while the dew point was only 21°; this shows the relative humidity to have been as low as 13 per cent. On this occasion the dew point was taken by means of ether, and I cannot place so much confidence in the result as if water had been used. Again, on March 29th, 1880, about 3 p.m., the means of 12 observations gave as follows:—dry bulb, 58°·7; wet bulb, 44°·7; the dew point, 13°·5; this makes the relative humidity 16 per cent. A difference of 25° between the temperature of the dry and wet bulbs has occasionally occurred in this country; this shows the air to have been very dry, but does not help us as far as relative humidity is concerned. The nearest approach to this difference of which I have any record, occurred on August 13th, 1876, at 3.40 p.m., when the dry bulb was 92°·6, the wet bulb 68°·4, the dew point taken at the same time by means of well water was 59°·5; this gives 34 as the relative humidity.

We have for many years past relied almost exclusively upon the indications of the dry and wet bulb thermometers to give us the relative humidity of the air, it is now admitted * that "all deductions from these are open to doubt." I should go further than this, and say that they ought not any longer to be used for that purpose. It is only too true to say, that out of the mass of observations which has been accumulating for the last few years, we have no data upon which we can rely, to ascertain to what degree of humidity the air attains in this country, and what is of far more importance, to compare the dryness of the air at one place with that at another; even at times when both thermometers read alike it does not follow that the air is saturated with vapour, or in other words, that its relative humidity is 100. Objections have been made to the form in which the

* See *Hints to Meteorological Observers*, page 11, prepared under the direction of the Council of the Royal Meteorological Society.

figures composing a table of relative humidity are given, but this is as nothing when compared with the manner in which those figures are obtained.

I should be sorry to say one word against the use of the dry and wet bulb thermometers, but the four instances given above, and which might be supplemented by thousands, show plainly that they are not fitted to give the dew point temperature, and it is to the persistent use of them for this purpose, that Mason's Hygrometer, one of the most simple and useful of all meteorological instruments has been brought into discredit.

GEORGE DINES.

Walton-on-Thames, April 24th, 1885.

RAINFALL AND PERCOLATION AT BEDFORD FOR THE PAST 18 MONTHS.

		Rain in inches.	Percolation. inches.	Loss inches.
1883.	November	2·17	1·10	1·07
,,	December	·87	·80	·07
1884.	January	1·70	·90	·80
,,	February	·65	·50	·15
,,	March	·91	·58	·33
,,	April	1·26	·15	1·11
,,	May	·70	·05	·65
,,	June	1·81	·15	1·66
,,	July	3·17	·70	2·47
,,	August	1·25	·13	1·12
,,	September	1·50	·65	·85
,,	October	1·17	·42	·75
,,	November	1·15	·55	·60
,,	December	1·77	1·15	·62
1885.	January	1·27	·80	·47
,,	February	1·77	1·40	·37
,,	March	1·17	·85	·32
,,	April	2·23	·94	1·29
	Total in 1½ yrs.	26·52	11·82	14·70

The light rainfall during the past eighteen months is very notable, and shows a marked contrast when compared with the wet and cold cycle of preceding years. The average rainfall of the nine years preceding 1884 was 26·25 in., and the past eighteen months being 26·52 in., is only a fraction more. If it be true, as is generally accepted, that the extra rains carried down a good deal of fertilising matter from the soil, the land must now have recovered its normal condition. Doubtless the low temperature of these summers, which accompanies leaky skies, had impaired the farm crops, and to both causes the husbandman may, in a great measure, ascribe his serious pecuniary difficulties. The percolation as measured by a Dalton gauge, having two and a half feet of earth of a medium water-holding power, amounts to 11·82 inches, and the remainder 14·70 in. has passed upwards by evaporation.

DAVID ROBIE.

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly Meeting of this Society was held on Wednesday, April 15th, at the Institution of Civil Engineers, 25, Great George Street, Westminster, Mr. R. H. Scott, F.R.S., president, in the chair, when the following papers were read :—

(1) "Report of Committee on Decrease of Water Supply." This Committee was appointed to take into consideration the question of the decrease of water in springs, streams, and rivers, and also the simultaneous rise of the flood-level in cultivated countries. As far as any inference can be drawn from the records collected by the Committee it appears that the years 1820, 1821, 1824, 1835, 1838, 1845, 1847, 1850, 1854, 1855, 1858, 1859, 1864, 1865, 1871, 1874, 1875 and 1884 have been periods of marked low water. On the other hand, the years 1817, 1825, 1830, 1836, 1841, 1842, 1853, 1860, 1861, 1866, 1873, 1877, 1879, 1881 and 1883 have been periods when there has been exceptionally high water. In 1852 the water was very low in the early part of the year, while at the end of the year it was very high. In the intervening periods the water has been of moderate altitude. It does not appear from existing records that there is any diminution in the water supply of this country, and the large quantity of water which has been stored or has flowed off the ground between 1876 and 1884 is confirmatory of this view. There appear, however, to be periods when there is exceptionally low water, and these are almost immediately followed by periods of exceptionally high water. With reference to the increase of floods, it does not appear from the records that there is any great increase in the height to which the floods rise in this country. Whether or not the height to which floods have risen in recent years has been affected by river improvements and the greater facility with which floods can be got rid of, or whether there is a diminution in the quantity of water, are questions upon which the Committee have not at present sufficient information to speak positively.

(2.) "Report of Committee on the Occurrences of the Helm Wind of Cross Fell, Cumberland, from 1871 to 1884." In response to a letter inserted in the Penrith newspapers, the Committee has received a number of communications bearing on the subject of the Helm Wind. With the view of ascertaining as far as possible the meteorological conditions which exist when the Helm Wind is blowing, all the recorded occurrences that have been received have been chronologically arranged. The first systematic record commences in 1871, and in this Report the Committee deals with all occurrences from that date to the end of 1884. Since that time, at the instigation of the Royal Meteorological Society, more detailed records have been commenced at numerous stations in the locality. Ninety-three instances of the Helm Wind were recorded between 1871 and 1884; the months with the greatest frequency being February, March, April and November. On examining the Daily Weather Reports it was clearly seen that whenever the Helm Wind was blowing there was

an Easterly wind, not only in the locality, but generally over the entire country. As the Helm Wind seemed to occur so regularly with the Easterly wind; the Committee further extended the inquiry with regard to the East wind. The Daily Weather Charts were consequently examined for each day from January 1st, 1871, to December 31st, 1884, and every occurrence of East wind was tabulated; the instances with general easterly conditions over the whole country being kept separate from those instances in which the Easterly wind was only partial, though of sufficient intensity to occasion the Helm wind. This examination showed that although the wind over the United Kingdom is generally Easterly when the Helm occurs, yet the Helm by no means occurs whenever the wind is Easterly. Indeed, this step in the inquiry has not at all tended to the elucidation of the phenomenon in question, for it frequently happens that the conditions are, to all appearances, precisely similar when the Helm is on, and yet no such occurrence has been recorded. This may in part be due to the occasional omission to record the Helm, although it cannot possibly be in the main attributable to such an omission; but it points to other conditions being necessary besides absolute agreement of wind direction and isobaric lines. Possibly the different hygrometric qualities of the air with the existing Easterly winds may be an important factor in deciding whether or no the Helm will be formed, but it is not readily conceived why even in this case the Helm wind should not blow. It must, however, be borne in mind that the surface winds only can be examined, whilst those at a comparatively small elevation may be intimately connected with the phenomenon. From the observations made prior to those started at the beginning of 1885, no idea can be formed of the behaviour of the upper currents even at the time of the occurrence of the Helm winds, far less with the occurrence of each East wind experienced. The Society has, however, provided for the extension of the inquiry in this direction in the records which are now being collected, the observers supplying observations of the upper currents by means of the clouds, as well as the direction of the winds at the surface of the earth. As soon as a sufficient number of these observations has been received the Committee hopes to present a further Report which will tend to explain the phenomenon of the Helm wind.

(3.) "Results of Meteorological Observations made at Asuncion, Paraguay," by R. Strachan, F.R.Met.Soc.

COLLIERY EXPLOSIONS.—In a paper contributed to *La Houille* on explosions of firedamp and barometric falls, M. de J. Lebrun throws a doubt on their connection. He says that several English engineers and men of science have sought to establish a coincidence between great barometrical depressions and explosions of firedamp; but an inspection of the tables published by the French Commission on Firedamp does not appear to prove this. There are as many explosions at moments when the barometer does not vary, and when it rises, as there are when it falls.—*English Mechanic.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCT., 1884.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	63·9	16	32·2	29	57·1	41·9	43·3	79	104·7	25·6	·99	10	6·0
Malta	82·2	7	56·8	30	74·9	63·4	59·8	77	131·9	51·3	1·32	5	3·8
Mauritius	82·0	9	60·1	1	78·9	66·7	62·5	74	134·3	53·0	2·85	10	5·3
Calcutta	88·2	13	65·9	30	84·9	73·3	72·4	82	153·0	52·0	3·71	5	4·2
Bombay	90·4	19	70·8	17	86·7	74·6	72·3	76	149·9	60·4	2·22	8	3·1
Ceylon, Colombo	85·2	7	72·4	20	83·6	75·1	72·2	78	145·0	64·0	13·51	27	7·4
Melbourne	86·0	25	36·0	7	65·1	46·5	45·1	72	145·0	29·1	3·04	16	6·2
Adelaide	91·8	19	41·7	13	69·6	50·2	45·5	58	146·0	32·9	1·32	10	5·2
Wellington	66·5	24	36·5	16	59·6	46·4	...	...	140·0	34·0	7·33	12	...
Auckland	68·0	27	43·0	15	63·1	50·5	47·2	70	143·0	36·0	2·86	21	6·0
Jamaica, Kingston	88·6	11*	68·5	19	86·7	72·5	72·3	82	...	...	9·00	...	7·2
Barbados	84·0	var.	70·0	22	82·0	72·0	75·9	84	146·0	...	9·54	19	5·0
Toronto	81·5	4	24·3	24	56·8	39·7	44·0	77	135·4	18·0	1·50	14	5·8
New Brunswick, Fredericton	71·8	1	20·2	16	52·8	32·4	34·8	74	...	...	2·68	13	5·6
Manitoba, Winnipeg	74·1	15	4·3	31	49·2	29·2	33·4	76	...	...	1·51	10	6·2
British Columbia, Victoria	62·0	13	30·0	2	...	...	...	...	...	..	4·88	14	...

* And 12.

REMARKS, OCTOBER, 1884.

MALTA.—Mean temp., 68°·0; mean hourly velocity of wind, 7·8 miles; sea temp. fell from 77° to 72°; T and L on four days, L on six. J. SCOLES.

Mauritius.—Rainfall, 1·31 in., and temp. 0°·1 above average; mean hourly velocity of wind, 1·3 miles below average; extremes 30·4 miles on 12th, and 1·7 miles on 19th; T and L on two days, L on one. Sky glows occasionally.

C. MELDRUM, F.R.S.

COLOMBO.—T on 16 days, L on 6. F. C. H. CLARKE, Major R.A.

Melbourne.—Mean temp. 2°·4, and temp. of dew point 1°·2 below average; rainfall, amount of cloud, humidity, and pressure all very near their respective averages. Prevailing winds S. and S.W., strong on six days; severe TS on 20th.

R. L. J. ELLERY, F.R.S.

Adelaide.—One of the coldest Octobers recorded here, mean temp. 59°·9, 2°·1 below average; rainfall and pressure slightly below average; amount of cloud slightly in excess. On the evening of the 19th a very heavy dust storm was preceded and followed by an unusually brilliant display of L; scarcely any T was heard, and very little R fell. C. TODD.

Wellington.—Up to the 6th fine and pleasant; severe TS and heavy R on 7th, 1·50in. falling before 9·30 a.m., causing floods and damage; tolerably fine till 13th, then stormy till 15th, with T, H and R; showery and squally to 20th; from the 21st to the 28th generally fine, then showery to the end. R. B. GORE.

Auckland.—On the whole a cold, showery and windy month; mean temp., rainfall, and pressure all slightly below the average. T. F. CHEESEMAN.

KINGSTON.—Very heavy R 7th and 8th in the eastern part of the island, with loss of life and much damage from floods; the night of 7th and morning of 8th were stormy also in Kingston, 7 or 8 inches of R falling, with gusts from S.E.

MAXWELL HALL.

BARBADOS.—Mean temp. (76°·4) 0°·6 below average; rainfall about the average; pressure fluctuating; mean hourly velocity of wind 5·1 miles, extremes 7·9 miles and 2·5 miles; 35 per cent below the average. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	1·37	XI.	Rhayader, Nantgwillt..	3·54
,,	Margate, Birchington...	·83	,,	Carno, Tybrith	1·72
,,	Littlehampton	·81	,,	Corwen, Rhug	2·43
,,	Hailsham	..	,,	Port Madoc	2·20
,,	I. of W., St. Lawrence.	·91	,,	I. of Man, Douglas	3·45
,,	Alton, Ashdell.....	1·63	XII.	Stoneykirk, Ardwell Ho.	2·73
III.	Winslow, Addington ...	1·97	,,	Melrose, Abbey Gate ...	2·82
,,	Oxford, Magdalen Col...	1·72	XIII.	N. Esk Res. [Penicuick]	2·00
,,	Northampton	2·05	XIV.	Ayr, Cassillis House ..	1·65
,,	Cambridge, Beech Ho...	1·98	,,	Glasgow, Queen's Park.	1·40
,,	Wisbech, Bank House..	·97	XV.	Islay, Gruinart School..	2·15
IV.	Southend	·71	XVI.	St. Andrews, Newton Bk	2·80
,,	Harlow, Sheering	1·77	,,	Balquhidder, Stronvar..	4·92
,,	Rendlesham Hall	1·59	,,	Dunkeld, Inver Braan..	3·29
,,	Diss	1·44	,,	Dalnaspidal H.R.S. ...	2·64
,,	Swaffham	1·50	XVII.	Keith H.R.S.	1·01
V.	Salisbury, Alderbury...	1·81	,,	Forres H.R.S.	·65
,,	Warminster	2·63	XVIII.	Strome Ferry H.R.S....	1·89
,,	Calne, Compton Bassett	1·92	,,	Lochbroom	·83
,,	Ashburton, Holne Vic..	6·94	,,	Tain, Springfield.....	·68
,,	Holsworthy, Clawton...	3·15	,,	Loch Shiel, Glenaladale	5·35
,,	Hatherleigh, Winsford.	3·44	,,	Invergarry	2·77
,,	Lynmouth, Glenthorne.	2·87	XIX.	Lairg H.R.S.	·61
,,	Probus, Lamellyn	3·86	,,	Forsinard H.R.S.	·98
,,	Wincanton, Stowell Rec.	3·21	,,	Watten H.R.S.	·95
,,	Wells, Westbury.....	3·15	XX.	Dunmanway, Coolkelure	5·70
VI.	Bristol, Clifton	2·18	,,	Fermoy, Gas Works ...	3·62
,,	Ross	...	,,	Tralee, Castlemorris ...	2·98
,,	Wem, Sansaw Hall.....	2·15	,,	Tipperary, Henry Street	3·75
,,	Cheadle, The Heath Ho.	1·85	,,	Newcastle West	1·54
,,	Worcester, Diglis Lock	2·13	,,	Miltown Malbay.....	2·46
,,	Coventry, Coundon	2·46	,,	Corofin	...
VII.	Melton, Coston	1·70	XXI.	Carlow, Browne's Hill..	3·81
,,	Ketton Hall [Stamford]	1·85	,,	Navan, Balrath	3·35
,,	Horncastle, Bucknall ...	1·30	,,	Mullingar, Belvedere ...	2·26
,,	Mansfield, St. John's St.	1·88	,,	Athlone, Twyford	3·47
VIII.	Macclesfield, The Park.	1·63	XXII.	Galway, Queen's Col....	2·60
,,	Walton-on-the-Hill.....	1·61	,,	Clifden, Kylemore	5·38
,,	Lancaster, South Road.	1·61	,,	Crossmolina, Enniscoe..	3·12
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	2·02
IX.	Wakefield, Stanley Vic.	1·53	XXIII.	Dowra	...
,,	Ripon, Mickley	1·82	,,	Rockcorry.....	3·55
,,	Scarborough.....	2·15	,,	Warrenpoint	4·35
,,	EastLayton[Darlington]	1·96	,,	Newtownards	2·53
,,	Middleton, Mickleton..	1·39	,,	Belfast, New Barnsley..	2·16
X.	Haltwhistle, Unthank..	1·74	,,	Cushendun	2·71
,,	Shap, Copy Hill	3·70	,,	Bushmills	2·26
XI.	Llanfrechfa Grange	2·42	,,	Stewartstown	2·02
,,	Llandovery	2·65	,,	Buncrana	1·85
,,	Castle Malgwyn	4·07			

APRIL, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·32	+ ·30	·79	15	11	72·8	20	29·3	4	3	13
II.		Maidstone (Hunton Court)...	2·17	+ ·32	·85	15	12	...	...	...	...	...	...
,,		Strathfield Turgiss	1·28	— ·63	·34	5	12	72·9	19	23·9	4	5	9
III.		Hitchin	2·68	+ ·73	·69	15	15	70·0	20	23·0	3	8	...
,,		Banbury	2·21	+ ·20	·56	15	15	69·0	21	25·0	5	4	...
IV.		Bury St. Edmunds (Culford)	1·67	— ·12	·39	9	15	73·0	22	22·0	2, 3	9	...
,,		Norwich (Cossey)	1·30	— ·56	·36	8	13	74·0	22	24·0	5	7	7
V.		Weymouth(LangtonHerring)	2·34	...	·56	28	14	...	...	...	...	...	...
,,		Barnstaple.....	2·44	+ ·06	·50	28	12	72·0	22	33·0	5	...	...
,,		Bodmin	5·82	+ 2·49	1·06	24	16	65·0	20	31·0	4	1	15
VI.		Stroud (Upfield)	2·15	— ·30	·75	1	16	70·0	21	30·0	2*c*	4	...
,,		ChurchStretton(Woolstaston)	3·26	+ ·94	·75	25	14	68·0	19	27·5	5	7	10
,,		Tenbury (Orleton)	2·48	+ ·31	·61	15	14	72·2	21	24·3	8	16	18
VII.		Leicester	2·24	...	·48	1	15	71·5	19*a*	25·5	5	3	17
,,		Boston	1·27	— ·62	·49	1	10	75·0	19	28·0	4	3	...
,,		Grimsby (Killingholme).....	1·82	+ ·06	·58	1	15	69·0	21	29·5	4	3	...
,,		Hesley Hall [Tickhill].....	1·57	...	·31	1, 6	14	71·0	19	23·0	4, 5	9	...
VIII.		Manchester (Ardwick).....	·92	— 1·11	·22	1	10	64·0	21*b*	29·0	4	4	...
IX.		Wetherby (Ribston Hall) ..	·91	— 1·60	·44	7	6	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·36	— ·70	·40	20	14	69·0	18	25·0	2	...	...
X.		North Shields	1·56	— ·44	·40	9	13	67·2	19	27·0	3	4	7
,,		Borrowdale (Seathwaite).....	9·45	+ 4·51	2·44	24	11	64·2	17	28·9	3	...	...
XI.	WALES.	Cardiff (Ely).....	2·60	+ ·26	·58	1	12	...	...	...	...	...	...
,,		Haverfordwest	3·32	+ ·50	1·19	25	9	63·0	9	25·0	2	11	20
,,		Plinlimmon (Cwmsymlog) ...	1·74	...	·41	25	10	...	...	...	...	..	...
,,		Llandudno.....	1·31	— ·57	·27	6	12	61·2	19	32·0	3	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·57	+ 1·28	1·62	24	9	64·0	18	26·6	3	5	...
,,		Jedburgh (Sunnyside).....	2·13	+ ·43	·49	10	12	65·0	18*c*	25·0	4	8	...
XIV.		Douglas Castle (Newmains)	2·23	+ ·35	·69	21	8	...	...	...	..	...	...
XV.		Lochgilphead (Kilmory).....	2·51	— ·12	·80	24	12	...	...	...	...	...	...
,,		Oban (Craigvarren)	2·87	...	1·06	20	12	58·5	17*i*	33·0	16	0	...
,,		Mull (Quinish).....	2·28	...	·62	24	11	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·30	+ ·09	·70	11	8	...	...	...	...	...	...
,,		Arbroath	2·65	+ ·74	·83	24	11	62·0	19*d*	31·0	2*f*	6	...
XVII.		Braemar	3·80	+ 1·72	·90	25	14	57·8	18	23·2	14	14	22
,,		Aberdeen	1·82	...	·71	24	14	65·0	19	29·0	13*g*	4	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	...	...	...	...	...	...	...	...	...	...	...
XIX.		Dunrobin	1·25	...	·41	24	7	61·5	18	30·0	14	6	...
,,		Orkney (Sandwick)..... ..	1·43	— ·44	·35	1	16	57·1	30	28·8	3	4	13
XX.	IRELAND.	Cork (Blackrock)	4·93	+ 1·83	1·26	5	15	75·0	18*c*	28·0	2	5	...
,,		Dromore Castle	2·95	...	·45	20*a*	14	60·0	19	31·0	2	...	...
,,		Waterford (Brook Lodge) ...	4·23	...	1·53	21	12	64·0	18	28·0	3	5	18
,,		Killaloe	...	...	...	...	...	...	...	...	...	...	...
XXI.		Portarlington	2·82	+ ·79	·83	21	14	65·5	20	31·5	8	6	...
,,		Dublin (FitzWilliam Square)	2·91	+ ·80	·62	21	16	66·1	19	32·2	3	2	9
XXII.		Ballinasloe	2·35	+ ·09	·44	21	16	62·0	19	29·0	4, 9	11	...
XXIII		Waringstown	2·13	+ ·24	·60	21	14	68·0	19	28·0	7*h*	6	11
,,		Londonderry (Creggan Res.).	1·44	...	·19	20	18	...	...	...	...	...	..
,,		Omagh (Edenfel)	...	...	...	..	...	...	...	...	...	...	...

a And 21. *b* And 28. *c* And 19. *d* And 20. *e* And 3, 4. *f* And 17. *g* And 14, 16. *h* And 8, 14. *i* And 19.

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—A fine month with much cold wind, and low temp. at night, and all crops made great progress; profusion of blossom on all fruit trees. Peacock-butterfly flying on 14th; first swallow seen on 15th; cuckoo first heard on 16th, and nightingale and wryneck on the 20th. Blackthorn in flower on 5th.

HITCHEN.—The hottest April since 1870.

BANBURY.—Mean temp. 45°·4, about the average; H and R and S in very large flakes on 15th; dripping mist on 10th; H on 26th; high wind on 6 days; cuckoo heard on 26th, nightingale on 28th.

CULFORD.—The month commenced with cold and frosty nights, but the weather being dry no injury was done to fruit trees.

LANGTON HERRING.—On the whole a fine month; during the first half the temp. was much below the average, but a change took place on the 16th, and the temp. from that day was above the average; the mean for the whole month was about 1° below the average of 12 years. E. winds very prevalent; T and high wind on 25th; fog on two days.

BODMIN.—The largest rainfall recorded in April for many years, being 2·80 in. above the average of 36 years; mean temp. 47°·3.

STROUD.—Cold winds and a backward spring. S.W. gale on the 25th.

WOLSTASTON.—There were sharp frosts at night during the early part of the month, and S fell heavily on the 15 and 16th; severe gales occurred on 5th and 24th. Mean temp. 44°·6; cuckoo first heard on 22nd; swallows seen on 20th.

ORLETON.—The weather was uniformly cold with a prevalence of cloudy days and frosty nights till the 17th, when a great rise of temp. took place, and it continued warmer till the end of the month. The mean temp. was more than 2° below the average of 24 years, but the max. was above 70° on three days. The weather was favourable for all farming operations, and for vegetation which was kept back. Pressure was generally low and unsteady, but the fluctuations were not great. Very strong wind on 25th, and a few trees blown down; cuckoo heard on 19th; many swallows seen on 21st.

LEICESTER.—The early part of the month was dull and cold; N. and N.E. winds prevailed until the 19th, when a change to S.W. occurred, after which the air was more genial and warm. R needed at the close of the month.

MANCHESTER.—A dry month, although the rainfall was about one-third greater than in April last year, and one-fourth greater than in April, 1883. There were several frosty nights at the beginning of the month, which retarded vegetation, and did no damage; the min. temp. rose as the month advanced, and the weather became quite genial, and vegetation made great progress.

SEATHWAITE.—Dry at the beginning of the month, and cold during the first half; very wet from 20th to 25th, 7·87 in. falling in the six days.

WALES.

HAVERFORDWEST.—R fell in large quantity on the morning of the 1st, followed by sharp frost till the 5th, when it blew a fresh gale with heavy R; broken, cold weather followed till 8th, from which date to the 15th it was keenly cold; from 17th to 20th very fine, warm, summerlike days occurred, after which the temp. decreased again, and it was stormy and wet from 25th to 27th, it was then cold to the end. A severe month, all fodder used up and no grass. Blackthorn blossomed on the 15th; cuckoo heard on the 25th.

SCOTLAND.

CARGEN.—Mean. temp. 1°·4 below the average. The first half of the month was unusually cold, northerly and easterly winds prevailing. Vegetation was very backward, a few beech trees only breaking into leaf towards the end of the month. 3·25 in. of the total R fell between the 20th and 25th.

JEDBURGH.—Remarkably dry weather with cold N.E. and E. winds until about the 19th; vegetation up to that date was very backward, and grass fields very brown. 1½ in. of S on 2nd; much T on 25th.

BRAEMAR.—The month, although cold, was favourable for seed sowing, but growth was much retarded.

ABERDEEN.—The weather was very seasonable for the agriculturist. Rainfall about half an inch below the average.

SANDWICK.—On the 2nd very severe H showers occurred, several panes of glass being broken in windows. The showers were worst in the early morning, from 4 a.m. to about 7 a.m.; one H stone was found to weigh 26 grains, and when melted measured 20 minims. Hoy hill white on 1st.

IRELAND.

BLACKROCK.—The max. temp. of the 18th and 19th was the highest recorded in April during the last 10 years.

DROMORE.—The first part of the month was rather hard with E. wind, and very little vegetation. Towards the end of the month heavy falls of R occurred at night, but the days were fine with showers and sunshine, and vegetation made great progress.

WATERFORD.—All the early part of the month E. and N.E. winds prevailed. Rainfall about 1·50 in. above the average of 25 years. Swallows seen on 16th; cuckoo heard on 25th; H on the 1st; trees very late in coming into leaf.

DUBLIN.—Until the 17th the weather was cold and dry with searching "polar" winds, but on that date the long-delayed spring may be said to have arrived with the setting in of equatorial winds. A burst of summerlike warmth on the 18th and 19th was followed by copious rains, soft winds and occasional hot sunshine by day, and rather low temp. by night. The mean temp. (45°.6) was 1°·4 below the average. Sleet fell on the 1st and 5th; H on the 9th and 16th; fog on five days. Mean humidity, 80; mean amount of cloud, 5·6; prevailing winds E., S.S.E., and S.W.

BALLINASLOE.—The first part of the month was generally fine, but with strong harsh winds, principally from E. and N.E.; the latter portion was wet, the harsh winds continuing.

WARINGSTOWN.—A most favourable month for farming operations, but grass at least three weeks later than usual, and all spring growth unusually backward, foliage being often as forward in the first week of April, as it was this year at its close.

FROST OF 1739-40.

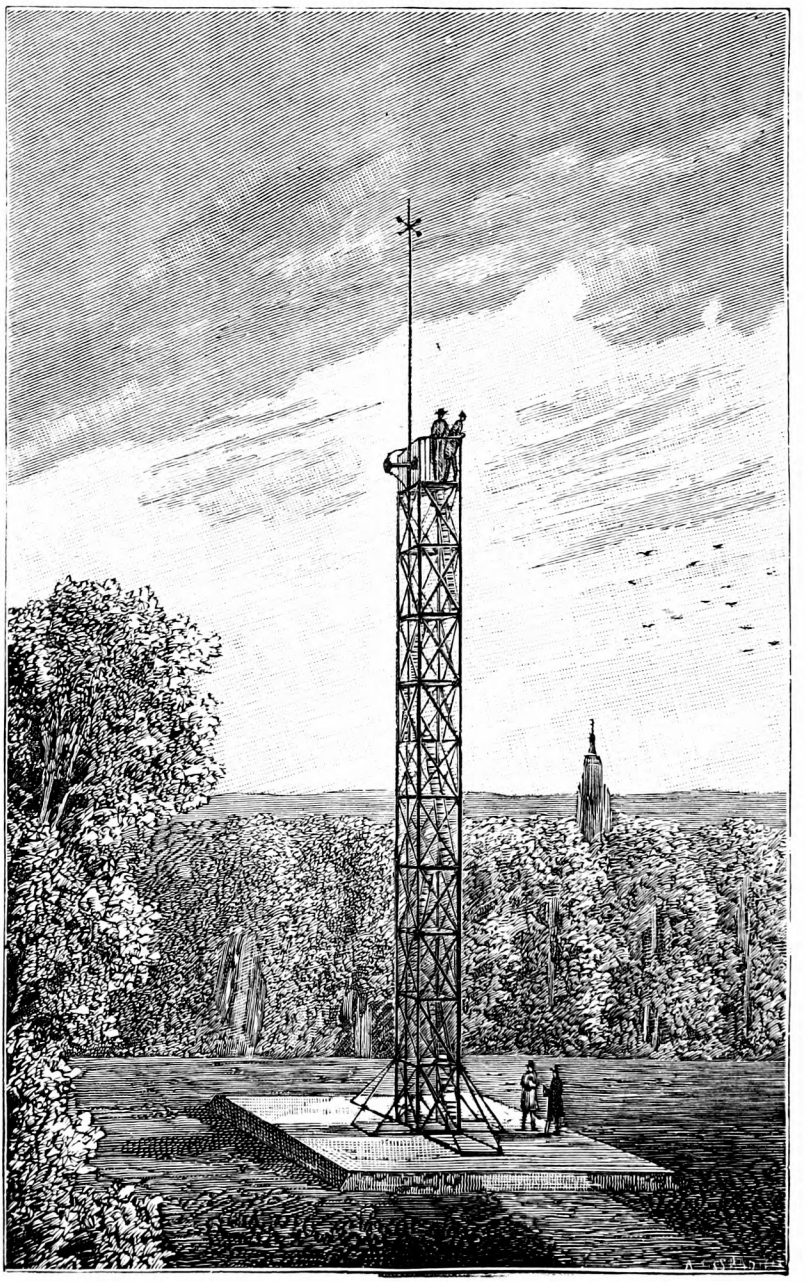
To the Editor of the Meteorological Magazine.

SIR,—The following extract from Harrod's "Antiquities of Stamford," may, perhaps, be of interest to the readers of your Magazine:—

"In the hard frost in 1740, at two different days, a sheep and a hog were roasted on the river Welland, where the ford is at the opening in Water-street. The printers also came and got much money by printing persons' names who assembled there. The hard frost began on Christmas eve in 1739, and lasted till Lady-Day, 1740; the greatest degree of cold was on January 5th in the morning; it frequently relented in the forenoon, but was sure to return at night; however, it was not so intense as the frost in 1709, when the Adriatic Sea was so frozen that it might be passed on foot, so that had the Venetians been at war with the Turks their city might have been taken by a land army. . . . . "—Yours truly,

FRED. COVENTRY.

Ketton Hall, Stamford, May 11th, 1885.



ANEMOMETER &c., TOWER AT M. HERVÉ-MANGON'S OBSERVATORY, BRÉCOURT SAINTE-MARIE-DU-MONT, MANCHE, FRANCE.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

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M. HERVÉ-MANGON'S IRON TOWER.

AFTER a life-long devotion to the application of Science to Agriculture, after years spent in the study of the influence upon land of irrigation and drainage, in which the Meteorological, the Engineering, the Chemical, and the Agricultural aspects were considered with equal care, we rejoice to see the Past President of the *Société Météorologique de France*, the Chairman of the French Meteorological Council put in what every one must admit to be his proper place, viz., that of (what we so much need in England) Minister for Agriculture.

But M. Hervé-Mangon is not one to let his duties as a statesman obliterate his love for Science; and we are glad not merely to lay before our readers the representation and description of one of his latest efforts on behalf of Meteorology, but also to add that at no remote period we have reason to hope for a useful contribution to Meteorological literature.

At present we have to deal solely with the Iron Tower, for the engraving of which we are indebted to the inventor's kindness.

And first, let us consider the need of such an edifice. Probably no one ever climbed a lofty tower without experiencing, on reaching the summit, a sensation of lightness and freshness, although few have taken the trouble to think out the causes of that sensation. The chief cause is undoubtedly the increased velocity of the air. It needs no scientific skill to perceive that the fluid ocean in which we live, must be retarded by friction, even where it passes over (say) a cornfield; while those who are familiar with what is known as skin-resistance will realize that even over a calm sea the retardation of the lower strata of an air current is decidedly important. When we pass to land, with hills, and trees, and houses, the resistance becomes very great, and the opportunities for obtaining strictly comparable records of the velocity of the wind become very rare. Here meteorologists come in and hitherto with the result of making matters worse instead of better, for with an utter disregard of common sense, they have hardly ever mounted two anemometers alike, either as regards the height above the ground at, or the shape of the edifice upon, which they are supported. We do not here go into the

subject, but append in a foot-note some references which anyone who thinks our remarks too severe had, before replying to them, better consult.*

M. Hervé-Mangon, being an engineer as well as a scientific man, has so designed his tower as to attain several separate objects. It is made almost wholly of angle-iron bolted together, and therefore all, except the base, is easily moved: in proof of which it may be mentioned that the tower represented in the engraving, which is 50 feet high, was made in the suburbs of Paris, sent to M. Hervé-Mangon's country seat, and erected, without any scaffolding or hoists, in three days by three men.

Angle-iron is used as giving the maximum of strength combined with a large surface, the object being to ensure that thermometric observations shall not be vitiated by the influence of the temperature of the mass of the tower. It is painted white, and it is found that even in full sunshine the iron is not 1° F. hotter than the surrounding air.

The provision of internal ladders is extremely convenient, and infinitely to be preferred to the "bear's pole" up which (some twenty years since) we used to climb morning and night in order to obtain a set of thermometric readings 20 feet above the soil, and clear of the influence of buildings. Far safer, too, than for example, the rain gauge masts at Calne, Castleton Moor, and Strathfield Turgiss, the anemometer mast at the Montsouris Observatory, or others, from some one of which a fatal accident is certain to occur.

This first tower is only 50ft. high, but it will be evident from the drawing that it is merely a question of heavier iron and therefore rather greater cost, to double or quadruple that height. The foundation is very simple—an excavation of two feet, with the first three feet of the tower set in a large square bed of concrete three feet thick.

The anemometer is a Robinson cup with M. Hervé-Mangon's arrangement for electrically recording its indications, which bye-the-bye it does in the laboratory 150 yards distant.

The mast slides in a tube by the side of the tower, and although this mast is nearly 50ft. long and weighs six cwt., it is so arranged that one person can, by means of a windlass at the top of the tower, easily raise or lower it in a few minutes.

When meteorologists arouse themselves to the fact that there are matters of more importance than determining the mean pressure at Shanghai true to 0·001 in., when they get out of the ruts into which so many of them drive, we shall see the great question of local

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*(1) Stevenson—Journal Scot. Met. Soc. Vol. V., p. 348.
(2) Reports of Court of Inquiry.....fall of Tay Bridge. London, 1880.
(3) Bender, Gaudard, Symons, Baker, Seyrig, Rogers Field and others, Min. Inst. Civil Engineers, Vol. LXIX., 1882.
(4) Archibald—*Nature*, Nov. 20, 1884, and Rep. Brit. Ass. Montreal, 1884, p. 639.

influence investigated; we or our successors shall see towers like this rendered useful alike to meteorology and to hygiene, by the determination of the influence of the earth's surface not merely on wind force, or on temperature, but upon the humidity and purity of the air by researches on the hygrometry and by analysis of the air at various heights, for both of which purposes this tower would be as perfectly suitable as it is for the subjects for which it was specially designed.

Dr. Borius.

We learn with great regret that Dr. Borius, several of whose works upon the climate of Senegal, and also upon that of Brest, have been brought before our readers, has at last fallen a victim to the climate of Tonkin. On the outbreak of hostilities he was selected by the French Government for service with the expedition, because of his medical and meteorological knowledge, and because his previous experience on the West Coast of Africa would, of course, be most useful. He was provided, by the Bureau Central Météorologique, with a complete set of instruments, and for a considerable period sent home very valuable records, but at last his useful career is over; he has fallen, like so many others, at the post of duty. Can one wish for more?

ROYAL METEOROLOGICAL SOCIETY.

The usual monthly meeting of this Society was held on Wednesday evening, the 20th inst., Mr. R. H. Scott, F.R.S., President, in the chair. Dr. H. Dobell, and Mr. J. N. Longden were elected Fellows of the Society.

The following papers were read:—1, "The Temperature Zones of the Earth considered in relation to the duration of the hot, temperate and cold periods, and to the effect of temperature upon the organic world," by Dr. W. Koppen, Hon.Mem.R.Met.Soc. 2, "Velocities of Winds and their Measurement," by Lieut.-Col. H. S. Knight, F.R.Met.Soc. The author, after describing the various ways of ascertaining the direction and velocity of the wind, makes several suggestions for the improvement of Robinson's anemometer. 3, "On the Equivalent of Beaufort's Scale in Absolute Velocity of Wind," by Dr. W. Koppen, Hon.Mem.R.Met.Soc. The author refers to Mr. C. Harding's paper read before the Society in December last on the anomalies in the various wind velocities given by different authors as equivalents for the numbers in Beaufort's scale; and, as illustrating the point, calls special attention to the want of agreement between the velocities obtained by Mr. Scott and those subsequently obtained by Dr. Sprung, and confirmed by himself. 4, "Note on a Peculiar Form of Auroral Cloud seen in Northamptonshire, March 1st, 1885," by the Rev. James Davis.

ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

To the Editor of the Meteorological Magazine.

SIR,—Mr. Dines, in the April number of the *Meteorological Magazine* maintains that all deductions from the psychrometer are open to doubt, and I affirm that so also are all deductions from condensing hygrometers, and that the former is a more simple and manageable instrument than are any of the latter. Psychrometers are comparable with each other, hygrometers are not, or there would not be so many varieties of them. For my part, I prefer the deductions from psychrometers to those from hygrometers. A condensing hygrometer, whether Daniell's, Regnault's, Dines's, or Alluard's, has the thermometer's bulb immersed in a cooling medium, and one surface of the dew plate is also in contact with the cooling medium, but the surface upon which the dew is formed is cooled by conduction, and is exposed to the air which may be many degrees, 50 or 60, or more, warmer. In these circumstances, when dew appears, the thermometer must be colder than the outside of the plate. When the dew disappears, the thermometer cannot have received the same addition of heat as the outer surface of the plate. These are the results of conduction, and in Dines' hygrometer the plate is glass, a bad conducting substance.

Mr. Dines states that on April 20th, while the psychrometer "remained remarkably steady," his hygrometer was "most erratic." Why? Great differences between the observed and computed dew-points occur with great dryness of the air. There is then great cold around the thermometer's bulb, while the outside of the plate where the dew is looked for, is exposed to great heat, and this is especially the case if the observer is short-sighted, and has to approach close to the instrument. The plate does not in fact cool so low as the thermometer, which accordingly gives a temperature much lower than the dew-point. The hygrometer never can give the correct dew-point when the air is very dry. Even supposing Mr. Dines' observations to be correct, before they can be used to test the formula for the psychrometer, the atmospheric pressure must be given. If the psychrometer is not fitted to give the dew-point temperature, and the relative humidity, for what is it fitted?—Yours faithfully,

R. STRACHAN.

11, Offord Road, N., May 25th, 1885.

[We strongly object to the name psychrometer, Ψυχρός Μέτρον, cold measurer), being given to the dry and wet bulb or to any hygrometer; but in the above letter we think that its use secures brevity and prevents confusion. The dry and wet bulb thermometer ought to be called Boeckmann's Hygrometer, but not one person in a thousand would recognise it under that name.—ED.]

THE FROZEN GROUND AT YAKOUTSK.*

Among the "Scraps" on page 26 will be found some remarks upon the above subject. We have since been favoured with the following letter from the highest authority upon underground temperature, Prof. Everett, F.R.S., the Secretary of the Committee of the British Association studying that subject, and editor of its sixteen consecutive reports :—

SIR,—I have looked up the reference in my reports respecting the Yakoutsk Well, referred to at page 26 of your March number.

General Helmersen is responsible for the calculation (see my fourth report, A), and he is probably right. You will notice that there is an extraordinary difference between the temperature at 100 feet deep and the mean temp. of Yakoutsk. Helmersen founds his calculation on the former, you found yours on the latter; hence the discrepancy in your results.

Leaving the air temp. out of the question, the data seem to stand thus :—

100 ft.	.....	—5·2 R.	.....	= 20·3 F.
540 ft.	.....	—1·4	.....	= 28·8

Whence is computed—

706 ft.	.. ...	0·0	.....	= 32·0

The gradient being 1°R in 117 ft., or 1°F in 52 ft.—Yours truly,

J. D. EVERETT.

Lennoxvale. Belfast, April 5th, 1885.

In order to put our readers in possession of all the details known to us or referred to in the British Association Report, we add the following paragraphs :—

A.—EXCERPT from General Helmersen's letter to Prof. Everett in 4th Report of Committee on Underground Temperature :—

"You are doubtless aware of the existence of a series of observations on the temperature of the soil at the bottom of a well which was sunk in the town of Yakoutsk in Eastern Siberia. This well has shown us that the soil of Siberia, at least in this part of its great extent, is frozen to a depth of 540 English feet. The mean temperature of Yakoutsk is −8°·2 R. = 13°·6 F. At the depth of 100 feet the temperature of the soil was found to be—5°·2 R. = 20°·3 F. From

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* We ought perhaps to apologise for the spelling here adopted, but the precise representation of the Russian name is not easy, as there are many ways of spelling it. We arrange a few in the alphabetical order, with the authority for each .—

IAKOUTSK.—Atlas of Useful Knowledge Society.
IAKUTSK.—Dr. Wild of St. Petersburgh.
IAKUTZK.—Prof. Dove.
JAKOUZK.—Dr. Erman.
JAKUTZK.—Prof. Dove.
JAKUZK.—Berghaus.
YAKOUTSK.—General Helmersen, of St. Petersburgh, and Keith Johnston.
YAKUTSK.—Blackie, Dr. Hann, and Keith Johnston.

this depth to the bottom the temperature increased at the rate of 1° R for every 117 feet, = 1° F in 52 feet; whence it would follow that the soil at Yakoutsk is frozen to the depth of about 700 feet."

EXCERPT from the Fourth Report of Committee on Underground Temperature.

An account of the Yakoutsk well is given in "Comptes Rendus," tome vi., 1838 (B), in an extract from a letter by Erman (fils), who visited Yakoutsk when the well had attained a depth of 50 feet. He gives the temperature at this depth from his own observations, and the temperatures at 77, 119, and 382 feet from the subsequent observations of the merchant to whom the well belonged. His figures differ very materially from those given above; but it may fairly be presumed that General Helmersen's account is the more accurate.

B.—COMPTE RENDU DES SEANCES DE L'ACADEMIE DES SCIENCES, 16th Avril, 1838, p. 501.—*Extract from a letter from* M. ERMAN *fils to* M. ARAGO, *respecting the temperature of the earth in* SIBERIA.

ABSTRACT.

IN my Journal I have epitomized the details of the climate of Yakoustk. A merchant there, M. Schergin, had, in the hope of reaching water, caused a well to be sunk, which at the time of my visit was 50 English feet deep, but I found the temperature constantly − 6° R [= 18°·5 F.], therefore the temperature of the air there cannot be greater, though the latitude is only 62°. Moreover, this agrees closely with the air temperatures as recorded by thermometers which I have myself verified. Hence it follows that water can only be reached when the natural rise of temperature amounts to 6° R [= 13½° F.]; this according to observations in other parts of Europe, and to my own in the Ural mountains, is 1° R for 90 or 100 French feet [= 1° F. in 42 to 47 ft.]. I should, therefore, not expect to reach 32° at Yakoustk at less than 500 to 600 French feet [533 to 640 English feet].

The observations made by M. Schergin since my visit, and during the digging of the well to 400 English feet, have thoroughly confirmed my previous remarks, having given—

77	English feet	− 5°·5 R.	= 19°·6 F.
119	,, ,,	− 4 ·0	= 23 ·0
382	,, ,,	− 0 ·5	= 30 ·9

But they indicate a rise of 1° R for 60 English feet [= 1° F for 26 English feet !] which is much more rapid than usual.

SUMMARY OF THE FACTS.

Mean temp. of air at Yakoutsk	13°·6 F.
Temp. according to Erman at 50 ft. ...	18 ·5
,, ,, ,, Schergin at 77 ft. ...	19 ·6
,, ,, ,, Helmersen at 100 ft....	20 ·3
,, ,, ,, Schergin at 119 ft. ...	23 ·0
,, ,, ,, ,, at 382 ft. ...	30 ·9
,, ,, ,, Everett at 540 ft. ...	28 ·8

From this it is evident that 32° is likely to be reached at some depth not exceeding 700 or 800 ft., but it would be very interesting to have the *details* upon which General Helmersen based his statement that "From this depth (100 ft.) to the bottom (540 ft.) the temperature increased at the rate of 1° F. in 52 ft."

We regret to see that the death of General Helmersen is just announced.

FROST OF 1739–40.

To the Editor of the Meteorological Magazine.

SIR,—With reference to Mr. Coventry's letter, I shall be very much obliged to any reader of the *Meteorological Magazine* who will inform me if any records of *thermometrical observations* taken during this frost exist; and, if so, by whom? and where were they kept?

I am Sir, yours truly,

G. T. GWILLIAM.

Bayswater, May 22nd.

[We have not time to make a careful search, but suggest that Mr. Gwilliam should look in the *Philosophical Transactions* for observations made at Oundle, Northamptonshire, by Mr. Lynne, and at Lyndon, Rutland, by Mr. Barker. We reprint for general use parts of the remarks upon December, 1739, and January, 1740, given by Dr. Huxham*, which will indicate the severity of the frost even at so comparatively mild a place as Plymouth.

DECEMBER.

Full Moon the 4th. New Moon the 19th.

The Weather in this Month was altogether surprising; In the Beginning of it we had a north-east Wind and a severe Frost, presently a rainy and turbulent south Wind; in a very short Time after a south-westerly, and a great deal of Rain, the Barometer nevertheless rising. The 14th and 15th the Wind was north-west; the 16th, north-east, and a Return of the Frost; the 19th and 20th, a violent south-east; on the 21st, again, a stormy south-west; from that an easterly to the 28th, a cold north-east Wind intervening, the 25th and 27th; then a most severe Storm from the East, with an exceeding severe Frost, and a constant exceeding small Snow to the very End. In an Instant a most piercing Cold froze up every Thing, both within Doors and without; nay, the very strongest Kinds of Wine were frozen; indeed whatever was exposed to the air instantly turned into Ice. People even shivered by the largest Fire's-Side, nor could keep themselves warm in their very Beds; indeed so very greatly were we benumbed by the excessive Cold, that we seemed scarcely alive. A most violent storm at the Close of *December* carried off a great Number of Birds, both small and great, from the Land, and drove them to a vast Distance from Shore, which, being quite tired with their long Flight, betook themselves to those Ships which were in the Midst of the Ocean, and were easily taken by the Sailors: "Mirum utiquè Genus aucupii?"—Nay, in the Beginning of the *January* following, I myself accidentally going on Board his Majesty's Ship,

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* Observations on the air and epidemic diseases from . . 1738 to . . 1748 by J. Huxham, M.D., F.R.S. Vol. ii. 8vo. London. 1767.

the *Weymouth* to see the Earl of *Deloraine*, who then lay sick, saw a Pie made of small birds, which the Sailors in their Return from *Lisbon* to our Port, had taken far, and far enough, from any Land.

Dig. Dec.
Rain 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 20. 21. 22. 23. 24. = 4·102.

Much Rain the 21st, 22d, and 23d, altho' the Barometer was at 30·1; besides we had a very violent south-west Wind; but the Air itself was exceeding thick and moist, an immense Quantity of Vapours being dispersed all over the Atmosphere. I was incapable of exactly estimating the Quantity of Snow which fell, being by the Impetuosity of the Wind blown out of the Receiver.

Greatest Height of ☿	16,	30·2, N.E. 1.	Mean Height
Least ———————	4,	29·1. S.S.W. 3x.	29·8.
Coldest Day in the Memory of Man,...	31,	90, E.N.E. 4x.	Mean Height
Warmest——————————...	10,	52, S.W. b W. 3x.	61 $\frac{26}{28}$

Some miliary and nervous Fevers, the Small-pox here and there, Quinsies and Opthalmies Common; Coughs, Rheumatisms, Pleurisies, and Peripneumonies, frequent.

JANUARY.

Full Moon the 2d. New Moon the 17th.

The Severity of the Cold still continued, such, indeed, as was never known in this Country. Altho' on 1st Day of the Month there was a very great thaw, and a Fall of Rain, nevertheless the north-easterly Wind and a most sharp Frost instantly returned, which lasted to the very End of the Month; and altho', by the Heat of the Sun, all things were thawed by Day, yet by Night they were bound up by a most rigid Frost. The Atmosphere was generally very thick, and appeared as if covered over with Smoak; but, between the 10th and 17th, exceeding thin. The coldest Days were the 11th, 15th, 16th, 17th, 18th, 26th, 27th, 28th; nay, so severe was the Frost which now prevailed, that all Kinds of Wine, being exposed out of Doors, were immediately turned into Ice; nay, the very Salt-water upon the Shores was so, a Thing this which very seldom happens in these Parts. Innumberable Trees and Shrubs were cut off by the Cold, and even the very hardy Furzes themselves; indeed, you could scarce see a green Herb. A vast Number of Sea Birds flew hither, and Numbers from Foreign Countries, which had hever been seen here before.

Dig. Dec.
Rain 1. 2. 9. ——— Snow and Hail 8. 9. =0·416.

I could not perceive any northern Lights all this Month, altho' the Wind was constantly northerly.

Greatest Height of ☿	14,	30·4, E.N.E. 2.	Mean Height
Least ———————	1,	29·1, S.W. 2.	$30·1\frac{14}{31}$
Coldest Day.....	26,	84, N.N.E. 1	Mean Height
Warmest —.....	31,	69, S.E. b E. 3x.	$75\frac{11}{31}$

Some explanation of the above temperatures is needed, as otherwise the entry of "90°, Coldest Day in the Memory of Man," would be puzzling. Dr. Huxham states that he used a thermometer graduated according to "Hauksbee's construction, fixed in a proper room," and on another page he says that his observations are comparable with the well-known series made in Edinburgh, 1731-35, where the thermometer was in a perforated box outside a north window. We think that Hauksbee's scale was that called by Martine the "Royal Society" scale; if so, Dr. Huxham's thermometer was a very bad copy. His max. temperature on a very warm day in July 1738

was 17, and 17° Royal Society is supposed to equal 82° Fahrenheit which would do very well; but he makes the mean temp. of Plymouth about 45 Royal Society, = 59° F., which is far too high. And lastly, his "Coldest Day in the Memory of Man," with 90° Royal Society, would give about 23° F, which is nothing like cold enough to correspond with his description of the effects. In fact it is perfectly evident that M. Wargentin was quite right when he wrote* respecting Hauksbee's thermometers, "Ces thermomètres ne valent absolument rien."]

ON THE MEASUREMENT OF THE ALTITUDE AND MOVEMENT OF CLOUDS.†

FOR the Swedish Arctic Expedition some special theodolites were constructed designed for the rapid determination of the position of prominent auroral phenomena. These instruments would evidently answer equally well for determining the position of clouds. The Academy of Sciences of Stockholm caused others to be made and placed, two of them at the disposal of the authors; also two telephones and the needful wire; the instruments were erected, one at the Observatory at Upsala, and the other about a quarter of a mile away. The observers being able to converse readily, the observations had a great advantage over all previous attempts. The present paper is rather descriptive of the instruments and of the modes of calculating than of the phenomena observed, but the facts seem to be extremely interesting and instructive. The base of a quarter of a mile proved too short, having regard to the altitudes to be measured, and this year they hope to resume their measurements with a longer one.

ON THE CLIMATE OF THE GOLD COAST.‡

NOT long since we were indebted to the Basel Missionaries for an extremely important and useful map of the portion of Africa in which they are working. In the little work now before us Dr. Riggenbach does several useful things: he epitomizes the meteorological work done on the Gold Coast, he gives us the results of observations made by Dr. Mähly, during his journey to, and also at, the Mission stations in the interior, he gives first attempts at diagrams of the daily curve of temperature, and of the barometric fluctuation from hourly observations between 9 a.m. and 10 p.m., discusses at some length the nature of the Harmattan, &c. In a historical intro-

* *Mém de l'Acad. de Suéde.* Tome xi. p. 178.

† *Mesures des Hauteurs et des Mouvements des Nuages,* par N. EKHOLM e K. L. HAGSTRÖM. Nova Acta Reg. Soc. Sc. Upsal. Upsal, Berling, 1885.

‡ Zum Klima der Goldküste; Von A. Riggenbach. Aus den Verhandlungen der Naturforschenden Gesellschaft in Basel. VII. Theil, 3 Heft. Basel: J. G. Baur, 1885.

duction Dr. Riggenbach gives a very useful list of observers and authors who have contributed to our knowledge of the district—a list which appears to us perfect, and which starts with Isert, in 1783, and ends with Mähly, in 1884.

The observations are terribly fragmentary, but Dr. Riggenbach recognizes the fact, and has shown thorough skill in turning them to the best account.

We cannot pretend to epitomize the whole paper, but we jot down some facts.

The highest temperatures seem to be at Christiansborg, which is almost at the level of the sea. The daily temperature curve for that station reaches its max. at 1 p.m., while at the inland stations, such as Abetifi (lat. 6°50′ N., lon. 0°43′ W., altitude 2,198 feet), it does not reach it till 2.30 p.m., and on fine days not till 3 p.m.

The following are approximate mean annual values :—

	Latitude.	Long.	Altitude.	Temp.	Rain.
	° ′	° ′	ft.	°	in.
Christiansborg.....	5 32 N.	0 10 W.	49	80·5	22·64
Elmina	5 3	1 20	...	79·3	30·79
Aburi	5 51	0 9	1542	73·4	41·68
Odumase	6 8	0 0	361	77·0	...
Abetifi	6 50	0 43	2198	72·0 ?	42·00?

THE "STAMFORD MERCURY."

To the Editor of the Meteorological Magazine.

SIR,—I learn that Mr. Parnham took meteorological observations daily while at Ufford, 1738—1764 (died 1764) and that a digest of them was published "in one of our newspapers of last year" as Jones writes in the summer of 1764. It is either this digest, or the newspaper of 1763 containing it, that I am anxious to see. I find that there are files of the *Stamford Mercury* at the Stamford Institution as far back as 1799, and at the British Museum, I am informed, as far back only as 1826. The first *Stamford Mercury* was printed by Thompson & Bailey, in St. Martin's, Stamford, about 1712. The first newspaper published in England, was dated July, 23, 1588; it was designed by the Lord Treasurer Burghley, to answer the same purpose as the present *London Gazette*.—I am, Sir, yours faithfully,

FRED. COVENTRY.

Ketton Hall, Stamford, June 2nd, 1885.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1884

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	60·2	7	25·3	25	48·3	37·3	38·4	85	84·6	21·4	1·92	12	6·7
Malta	71·6	5	49·2	22	66·5	56·8	51·9	75	118·2	44·0	5·24	12	4·8
Mauritius	83·6	21	63·7	23	80·4	68·8	64·0	73	134·7	54·4	2·21	9	4·7
Calcutta	85·3	2	54·8	29	79·7	62·1	60·2	73	144·7	39·9	0·01	1	2·4
Bombay	88·7	6	66·6	19	86·3	71·4	66·8	67	144·7	53·3	0·60	1	1·6
Ceylon, Colombo	87·2	20	71·0	25†	85·2	73·2	70·3	74	145·0	59·0	17·73	14	6·0
Melbourne	92·9	20	41·7	9	70·0	51·0	48·6	68	151·5	32·7	3·11	12	6·3
Adelaide	94·0	20	46·0	30	76·9	55·2	46·3	48	155·0	32·2	0·37	8	4·3
Wellington	67·3	3	40·8	7	60·5	47·7	...	...	143·0	35·0	4·28	13	...
Auckland	70·5	22	45·0	11‡	64·8	51·5	48·4	71	139·0	40·0	2·08	13	6·9
Jamaica, Kingston	90·1	4	67·6	17	87·9	71·2	71·1	81	...	63·0	1·46	...	4·8
Barbados	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	54·1	10	10·7	27	40·5	27·3	29·8	81	106·2	4·5	2·31	13	7·1
New Brunswick, Fredericton	50·3	5	8·7	19	39·4	23·3	26·0	79	...	...	4·40	14	6·5
Manitoba, Winnipeg	49·2	13	-25·1	23	26·0	9·6	19·6	86	...	...	0·83	8	6·5
British Columbia, Victoria	58·0	7	27·0	22	...	...	...	...	...	..	1·60	11	...

* And 22. † And 27. ‡ And 12.

REMARKS, NOVEMBER, 1884.

MALTA.—Mean temp., 60°·6 ; mean hourly velocity of wind, 9·3 miles ; TSS on three days, H on 1. J. SCOLES.

Mauritius.—Rainfall ·82 in. above, and temp. 0°·6 below average ; mean hourly velocity of wind, 0·6 mile below average ; extremes 27·9 miles on 7th, and 2·1 miles on 14th, prevailing direction S.E. by E., to E. by N. L on 6th. C. MELDRUM, F.R.S.

CEYLON.—TSS on 4 days, T on 1, L on 3. F. C. H. CLARKE, Major, R.A.

Melbourne.—Mean. temp., 0°·7 below average, rainfall ·67 in., and temp. of dew point, humidity, amount of cloud, and pressure slightly above their respective averages. Prevailing winds S. and S.W., strong on 8 days ; TS on 6th; L on 12th ; lunar halos on 2 days. R. L. J. ELLERY, F.R.S.

Adelaide.—As a whole, fine and pleasant, rainfall only about one-third of the average ; mean temp. slightly below, and pressure considerably above the average ; amount of cloud less than usual ; TSS on 2 days. C. TODD.

Wellington.—Fine till 4th, when a N.W. gale blew at night, followed by showery, unpleasant weather till 12th (2·33 in. of R on 7th) ; from 12th to 21st, finer weather, though unsettled and changeable ; remainder of the month generally showery and squally ; prevailing wind, N.W. ; mean temp (54°·1), 2°·7 below average ; rainfall slightly below, and pressure slightly above average. R. B. GORE.

Auckland.—A cold, though fine month ; rainfall considerably below, and pressure slightly above their respective averages. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	...	XI.	Rhayader, Nantgwillt..	4·51
,,	Margate, Birchington...	1·90	,,	Carno, Tybrith	3·73
,,	Littlehampton	2·74	,,	Corwen, Rhug	2·20
,,	Hailsham	2·97	,,	Port Madoc	2·09
,,	I. of W., St. Lawrence.	2·33	,,	I. of Man, Douglas	2·18
,,	Alton, Ashdell.....	4·92	XII.	Stoneykirk, Ardwell Ho.	2·10
III.	Winslow, Addington ...	2·87	,,	Melrose, Abbey Gate...	3·72
,,	Oxford, Magdalen Col...	2·03	XIII.	N. Esk Res. [Penicuick]	2·65
,,	Northampton	2·44	XIV.	Ayr, Cassillis House ...	..
,,	Cambridge, Beech Ho...	3·23	,,	Glasgow, Queen's Park.	2·84
,,	Wisbech, Bank House..	2·35	XV.	Islay, Gruinart School..	2·81
IV.	Southend	..	XVI.	St. Andrews, Newton Bk	3·57
,,	Harlow, Sheering	3·61	,,	Balquhidder, Stronvar..	3·90
,,	Rendlesham Hall	2·91	,,	Dunkeld, Inver Braan..	5 05
,,	Diss	3·10	,,	Dalnaspidal H.R.S. ...	5·28
,,	Swaffham	2·76	XVII.	Keith H.R.S.	3·57
V.	Salisbury, Alderbury...	3·21	,,	Forres H.R.S.	1·62
,,	Warminster	3·33	XVIII.	Strome Ferry H.R.S....	4·26
,,	Calne, Compton Bassett	2·47	,,	Lochbroom	3·69
,,	Ashburton, Holne Vic..	4·08	,,	Tain, Springfield.....	2 43
,,	Holsworthy, Clawton...	2·42	,,	Loch Shiel, Glenaladale	5·93
,,	Hatherleigh, Winsford.	3·27	,,	Invergarry	3·39
,,	Lynmouth, Glenthorne.	3·08	XIX.	Lairg H.R.S.	4·75
,,	Probus, Lamellyn	3·18	,,	Forsinard H.R.S.	3·41
,,	Wincanton, Stowell Rec.	3·09	,,	Watten H.R.S.	1·83
,,	Wells, Westbury.....	2·97	XX.	Dunmanway, Coolkelure	3·66
VI.	Bristol, Clifton	3·26	,,	Fermoy, Gas Works ...	3·13
,,	Ross	2·00	,,	Tralee, Castlemorris ...	2·99
,,	Wem, Sansaw Hall.....	2·28	,,	Tipperary, Henry Street	2·49
,,	Cheadle, The Heath Ho.	2·02	,,	Newcastle West	2·39
,,	Worcester, Diglis Lock	2·70	,,	Miltown Malbay.....	2·31
,,	Coventry, Coundon	2·40	,,	Corofin	...
VII.	Melton, Coston	1·83	XXI.	Carlow, Browne's Hill..	2·39
,,	Ketton Hall [Stamford]	2·16	,,	Navan, Balrath	1·84
,,	Horncastle, Bucknall ...	1·49	,,	Mullingar, Belvedere...	1·67
,,	Mansfield, St. John's St.	1·98	,,	Athlone, Twyford	2·26
VIII.	Macclesfield, The Park.	1·94	XXII.	Galway, Quen 's Col....	2·10
,,	Walton-on-the-Hill.....	1·57	,,	Clifden, Kylemore	5·20
,,	Lancaster, South Road.	2·52	,,	Crossmolina, Enniscoe..	3·65
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	2·33
IX.	Wakefield, Stanley Vic.	1·45	XXIII.	Dowra	...
,,	Ripon, Mickley	2·74	,,	Rockcorry.....	...
,,	Scarborough.....	1·93	,,	Warrenpoint	1·57
,,	East Layton [Darlington]	3·56	,,	Newtownards	1·65
,,	Middleton, Mickleton ..	4·07	,,	Belfast, New Barnsley..	2·88
X.	Haltwhistle, Unthank..	2·45	,,	Cushendun	2·03
,,	Shap, Copy Hill	3·10	,,	Bushmills	2·27
XI.	Llanfrechfa Grange	3·71	,,	Stewartstown	1·94
,,	Llandovery	3·16	,,	Buncrana	2·62
,,	Castle Malgwyn	2·39			

MAY, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·63	+ ·71	·39	21	19	73·8	28	31·1	8	1	7
II.		Maidstone (Hunton Court)...	3·36	+ 1·34	·55	28	17	...	...	...	...	...	...
,,		Strathfield Turgiss	2·45	+ ·77	·55	21	18	68·3	28	30·2	12	2	7
III.		Hitchin	2·51	+ ·52	·61	21	16	68·0	28	31·0	7*a*	2	...
,,		Banbury	2·48	+ ·35	·54	25	17	70·5	27	29·5	8	3	...
IV.		Bury St. Edmunds (Culford)	3·17	+ 1·27	·43	25	21	79·0	28	30·0	7*b*	6	...
,,		Norwich (Cossey)	3·15	+ 1·34	·48	28	19	77·0	28	28·2	15	5	7
V.		Weymouth(LangtonHerring)	2·73	...	·85	21	20	...	...	...	...	...	...
,,		Barnstaple.....	3·21	+ 1·11	·67	19	17	69·0	28	41·0	7*c*	...	...
,,		Bodmin	3·17	+ ·33	·76	21	25	65·0	31	36·0	7*d*	0	7
VI.		Stroud (Upfield)	2·56	+ ·26	·51	21	23	75·0	28	32·0	7	1	...
,,		ChurchStretton(Woolstaston)	2·39	·00	·25	9*e*	22	65·0	27	33·0	7, 8	0	6
,,		Tenbury (Orleton)	3·40	+ ·97	·58	5	24	66·8	28	28·6	8	5	9
VII.		Leicester	2·49	...	·55	21	20	71·7	28	31·7	8	2	27
,,		Boston	1·67	— ·10	·32	5	19	73·0	28	32·0	8	1	...
,,		Grimsby (Killingholme).....	1·93	+ ·28	·29	1	22	72·0	28	32·0	8	0	...
,,		Hesley Hall [Tickhill].....	1·67	...	·30	3	18	75·0	28	29·0	12	4	...
VIII.		Manchester (Ardwick).....	1·68	— ·55	·24	23	19	69·0	27*f*	35·0	8	0	...
IX.		Wetherby (Ribston Hall) ...	3·09	+ 1·27	·49	22	14	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·89	+ ·77	·63	3	22	...	...	...	...	...	...
X.		North Shields	2·75	+ ·90	·37	20	22	71·0	28	29·5	7	5	...
,,		Borrowdale (Seathwaite).....	6·30	— ·68	1·15	20	23	60·1	28	28·5	7	...	...
XI.	WALES.	Cardiff (Ely).....	3·77	+ 1·17	·85	19	23	...	...	...	...	...	...
,,		Haverfordwest	3·41	+ ·72	·70	20	16	64·0	26*g*	28·5	11	4	8
,,		Plinlimmon (Cwmsymlog) ...	2·82	...	·40	1	19	...	...	...	...	...	...
,,		Llandudno.....	1·08	— ·54	·26	10	11	64·5	26	36·8	7	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·06	— ·47	·38	20	15	60·4	28	30·0	8*d*	4	...
,,		Jedburgh (Sunnyside).....	2·58	+ ·79	·53	1	15	64·0	26	28·0	12	6	...
XIV.		Douglas Castle (Newmains)	2·82	+ ·48	·71	1	16	...	...	...	..	...	...
XV.		Lochgilphead (Kilmory).....	3·11	+ ·35	·42	27	21	...	...	...	...	...	...
,,		Oban (Craigvarren)	2·39	...	·35	21	17	60·7	26	31·0	7	2	...
,,		Mull (Quinish).....	2·91	...	·43	27	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·90	+ 1·61	·80	21	16	...	...	...	...	...	...
,,		Arbroath	2·98	+ 1·21	·58	20	17	63·0	29	32·0	12	1	...
XVII.		Braemar	4·62	+ 2·20	·69	20	28	59·8	28	27·3	12	10	14
,,		Aberdeen	3·84	...	·86	9	23	62·0	28	30·0	12	3	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	2·96	+ 1·18	...	...	...	64·0	28	31·0	6*d*	2	13
XIX.		Dunrobin	3·47	...	·59	20	22	60·0	28	30·0	12	2	...
,,		Orkney (Sandwick)..... ..	1·70	— ·17	·36	8	22	60·5	28	32·5	7, 9	0	8
XX.	IRELAND.	Cork (Blackrock)	3·29	+ 1·13	·59	19	22	69·0	12	31·0	7	2	...
,,		Dromore Castle	4·33	...	·50	2*f*	19	60·0	31	31·0	13	...	...
,,		Waterford (Brook Lodge) ...	2·85	...	·63	19	24	63·0	31	31·0	8	1	19
,,		Killaloe	...	..	...	...	...	...	...	...	...	...	...
XXI.		Portarlington	2·04	+ ·19	·46	20	24	61·5	26	31·0	6	...	1
,,		Dublin (FitzWilliam Square)	2·53	+ ·81	·49	19	23	64·5	28	32·7	7	0	6
XXII.		Ballinasloe	2·09	— ·32	·35	19	24	65·0	31	29·0	7	4	...
XXIII		Waringstown	1·65	— ·46	·37	23	16	66·0	25	29·0	6, 7	3	6
,,		Londonderry (Creggan Res.).	3·24	...	·37	8	26	...	...	...	...	...	...
.		Omagh (Edenfel)	2·39	+ ·04	·32	23	25	65·0	16*h*	28·0	7	6	...

a And 11. *b* And 11, 12, 13, 14. *c* And 19. *d* And 12. *e* And 25. *f* And 28. *g* And 31. *h* And 27.

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON MAY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—An unsettled month, with low temp. Cold winds and storms, and frosts at night prevailed until the last few days; altogether the coldest May remembered. Growth of all kinds checked, keep for stock very scarce, and everything remarkably backward. TS on 3rd and 17th, with H on the latter day. First swift seen on 1st; first pheasant hatched on 9th; young frogs seen on 15th; corn-crake heard on 25th; orange tip butterfly flying on 26th, and large white butterfly on 28th; wild strawberry in flower on 2nd, lilac on 6th, mountain ash on 10th, horse-chestnut on 13th, may on 14th, laburnum on 17th, oak in leaf on 10th.

BANBURY.—Mean temp. 48°·3, 4° 0 belowthe average. Upon the whole a favorable month and not much damage done by frost. Hawthorn abundantly blossoming at the end of the month, but petals much touched by frost in low situations near water, and having a singularly shabby appearance. Slight S on 7th and 8th, T and L on 3rd, T on four other days, H on one day.

CULFORD.—The month was generally stormy, and the nights were as a rule cold. H with distant T occurred several times.

LANGTON HERRING.—A cold ungenial month. Mean temp. 2°·6 below the average of 13 years; and max temp. the lowest in May during 14 years, with the exception of 1877. The highest min. also was low, and from the 1st to the 25th, the temperature fell every night to or below 45°. Dense fogs occurred on the 25th and 26th, and foggy weather was experienced on the following four days; T on 3 days, and solar halos on 3 days.

BODMIN.—A cold ungenial month. Mean temp. 52°·0.

STROUD.—A cold month, and a very backward season, T and L on 10th and 13th. H storms on 22nd.

WOOLSTANSTON.—A cold month; mean temp. 47°·0. Apple trees show an unusual amount of blossom, giving promise of a magnificent crop. T on 3rd and 14th.

ORLETON.—A very cold and stormy month with frequent falls of R; till the 24th the weather was very cold, the max. temp. never rising to 60°·0; the remainder of the month was warmer, but not equal to the average; the mean temp. for the whole month was more than 4°·0 below the average of 24 years, and about 0°·6 below that of 1879. Pressure was lower than usual, but the fluctuations were not great. There was much blossom on all fruit trees, but later than usual. Distant T was heard on the 3rd. A fall of S covering the ground occurred on the night of the 5th.

BOSTON.—The weather was very changeable, the range of temp. being 41°·0. There were some days with fine weather, sunshine and mild temp., and others bitterly cold, with H and S; T and L also occurred. The generally ungenial weather with low temp., R and frosts, coming after the fine weather at the end of April, was anything but beneficial to vegetation, and wheat, especially on poor and heavy lands began to turn yellow and look sickly; the warmer weather and showers at the end of the month did much to revive vegetation generally.

KILLINGHOLME.—A fine month, but with many frosty nights; crops of all kinds giving good promise. T on 16th, 21st, and 29th.

MANCHESTER.—The month was cold for the season; although the temp. here did not fall below 35°, there were hard frosts in the country around this city; there were a few genial days in the last week, when the temp. rose to 69°.

NORTH SHIELDS.—TSS on 8th, 21st, 22nd and 25th and T on 16th and 29th. S and H on 7th and 10th.

WALES.

HAVERFORDWEST.—The month commenced wet and unsettled; and was very bleak and cold with sharp night frosts up to the 18th; the last week was much warmer and more genial. TSS on 3rd and 9th. Oak in leaf on 20th, ash only commencing to unfold, white-thorn in blossom on 30th. A great promise of hay. Sharp TS on 3rd; TS on 9th.

LLANDUDNO.—A dry bright month with ample sunshine (183 hours); but mean temp. no less than 4°·0 below the average, owing in a measure possibly to the unusual number of icebergs in the Atlantic. The daily and total range of temp. were considerably below the average, and there was no frost.

SCOTLAND.

CARGEN.—The coldest May experienced since observations were commenced 25 years ago; mean temp. 46°·0, 4°·9 below the average; the lowest means for the month previously observed are 48°·9 in 1866, 46°·8 in 1869, and 48°·9 in 1883. Vegetation in a very backward state, few oaks being in leaf and still fewer ashes; the oak and ash have not before been observed coming into leaf so nearly at the same time, the oak, in this district, being generally speaking about ten days or a fortnight before the ash. T on six days, L on one, S and H on one.

JEDBURGH.—The weather was cold and ungenial, and though the rainfall exceeded the average for the month, the frequent cold winds soon dried it up, and little or no interruption was caused to country work except for a few days at the beginning of the month. Fruit blossom was abundant and as it escaped the frost, a good crop is hoped for. S on 5th, H on 6th, 9th and 10th. T on 7th, 10th, 15th and 16th. L on 10th and 16th.

OBAN.—A decidedly cold May, with a preponderance of N. winds, and a frequency of light rains. Vegetation very backward, owing to the cold, and green crops scarcely through the ground. On the 22nd and 27th, there were notable examples of white cloud fog which came up from the Atlantic and remained hanging over the sea for many hours, that of the 22nd being dispelled by northerly winds, that of the 27th being driven and succeeded by a strong gale from the S.W. T and L on 19th.

QUINISH.—A very cold, backward month from first to last.

BRAEMAR.—More or less S fell on nine days.

ABERDEEN.—The weather throughout the month was very wet and unsettled, the rainfall being two inches above the average; a severe S storm occurred in the early morning of the 10th; H on four days.

CULLODEN.—The early part of the month was cold, and there were late frosts; pastures made little, and in many places no advance; during the last week the weather was more genial.

IRELAND.

DROMORE.—The month was very cold with plenty of R; not much vegetation.

WATERFORD.—The month was cold and ungenial, the late frosts nipping early potatoes, but fruit blossom was most profuse. T and H showers occurred on several days, and on 21st a house was struck, and a tree split by L; on 8th heavy H fell, some of the stones being $\frac{3}{4}$ in. long, and $\frac{1}{2}$ in. across. S.W. gale on 28th and 29th.

DUBLIN.—For the most part a cold, showery month. Up to the 24th there was a remarkable and persistent deficit of temp. associated with a prevalence of polar winds, chiefly from N.W., and frequent H showers. The coldness of the weather was probably due to the melting of S and ice in Russia and the Baltic on the one hand, and on the other to the presence of vast ice-fields in the Atlantic as far south as Lat. 44°, and as far east as Long. 46° The distribution of cold and warmth during the month was similar to that observed in April—first came a long cold period, and then a sudden change to warmer

weather; but in May the max. temp. in shade (64°·5) fell short of the max, in April (66°·1) by 1°·6. At 2 p.m. on 17th, an exceptionally violent downpour of H occurred. TSS with H on 2nd, severe H storms on 10th, and L in the evening; fog on 20th. The mean temp. (47°·4) was 3°·5 below the average, the month being colder than any previous May for at least 20 years, the mean temp. of May 1869 (47°·5), and that of May, 1879 (47°·6) being the nearest. Mean humidity 76; mean amount of cloud 5·7; prevailing winds W., N.W. and S.W.

WARINGSTOWN—The latest spring remembered; foliage not much more forward at the close of the month than it usually is at the commencement.

EDENFEL.—The weather of the month, except a few days at the beginniug and end, was cold, wintry and wet. S on 6th, and H and sleet almost daily from thence to the 23d·

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—Referring to Mr. Brenan's letter in your last number, permit me to remark that it appears to me that the Hebrideans, for lack of a mercurial barometer, have been in the habit of using an aqueous one to enable them to forecast cyclonic disturbances.

If from any cause the atmospheric pressure be lightened over a limited area of any body of water, the surrounding heavier air will force the water to rise in the limited area, just as it does in a common pump when the piston lifts up the pressing atmosphere inside the pump barrel. Within the cyclonic circuit the atmospheric pressure is less than outside, consequently the sea-surface embraced by the cyclone will rise in proportion to the difference of pressures; and so therefore as the cyclonic disturbance of balance travels eastward, overshadowing the Western Isles, so certainly will the sea-surface rise above the normal. The Islesmen of the past, not being in possession of artificial barometers, have ingeniously made use of the only substitute available—a natural one.

The moral of the matter is this. Instead of longer waiting for records of tides, let the Islesmen of Scotland and Ireland get, or be furnished with, good barometers, which will inform them quite as well as the sea-level regarding the diminution of atmosperic pressure.

As I have the pen in hand, excuse my adverting to what seems to me an unfortunate perversion of phrases. It is well known that within the area of a cyclone the air ascends, and, rising higher than the surrounding regions, flows over into them. Yet ever and anon we are told that an area of *depression* is travelling over certain districts. It may be explained that a depression of the mercury in the barometer is what is meant. But that is never said, and to most people the expression will convey the impression that it is the air that is alluded to; as they observe the air travelling, whilst the barometer continues to hang on its peg.

HENRY MUIRHEAD.

Cambuslang, May 18th, 1885.

SYMONS'S

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SCINTILLATION AND WEATHER FORECASTING.

"Twinkle, twinkle little star,
How I wonder what you are,
Up above the world so high,
Like a diamond in the sky."

WE are not prepared to show that the above quotation contains any indication of the author's scientific knowledge, but we could not bring ourselves to entitle this paper "Twinkling and Weather Forecasting," or else something besides the stars would have twinkled; on the other hand, the title we have chosen might *per se* have frightened away some whom we wish to read the following pages. Hence it was that we brought the above quotation to our rescue.

One other prefatory remark, viz., that the following pages are suggested by, founded upon, and condensed from, papers in the Belgian Meteorological Journal, *Ciel et Terre* (which we have often commended to our readers), and especially from the article "*La Scintillation des étoiles dans ses rapports avec les phénomènes météorologiques*" in which M. Montigny has been so kind and beneficent as to epitomise the result of his work upon the subject during the last quarter of a century.

In the first place we may mention that the twinkling of the stars (it will be remembered that the planets do not twinkle) has been skipped by a host of writers upon astronomy. It is useless to give a list of the works which omit all reference to it, and we therefore reproduce merely the short chapter in which Arago epitomizes his (we believe the first) thorough discussion of the subject.

ON SCINTILLATION.*

In the case of a person observing the stars with the naked eye, scintillation consists in rapid variations of brightness. These variations are often accompanied with changes of colour, and with alterations in the apparent diameters of the stars, or in the lengths of the diverging rays, which appear to dart from their centres in different directions. Scintillation in telescopes is accompanied with peculiar features. This phenomenon arises from the peculiar properties possessed by the constituent rays of light, of moving with different

* Popular Astronomy—Smyth and Grant's translation, Vol. I. (1855), p. 135.

velocities through the strata of the atmosphere, and of producing what is called interferences. We have devoted an entire Notice to the explanation of this curious fact, which has occupied the attention of the greater number of astronomers. It would be too long for insertion here ; and we think it useless to analyse its contents. It will suffice to state that the rapid changes of brightness and colour which the stars exhibit, are connected in the present day with the known laws of physics, and especially with those of luminous interferences. The more or less vague explanations of scintillation given by different astronomers are inadmissible ; they do not show why the planets, for example, do not scintillate ; why certain stars scintillate less than others ; why the purity of the sky and the low temperature of the nights add to the beauty of the phenomenon.

The first to make systematic observations on the amount of scintillation was Professor C. Dufour of Morges, on the Lake of Geneva ; he was followed very shortly afterwards by M. Montigny, of Brussels, and we think that it is within the mark to say that they two have done more towards elucidating the subject than all the rest of the world before or since. The former is quoted in the *Royal Society Catalogue* as the author of three papers on the subject, and the latter as author of eight, prior to 1873 when the last catalogue closes.

Professor Dufour began by trying several forms of scintillometer (twinkle measurer) which had been suggested by Arago and by others, but as he was not satisfied with any of them, he started a system of record with the naked eye, on an estimated scale with 0 for no scintillation, and 10 for the maximum. During about three years 1853–6 he did not lose a single evening when the stars were visible, and thus he amassed more than 13,000 records. The discussion of these observations led to the following conclusions :

(1) Red stars scintillate less than white ones.

(2) Except close to the horizon ; the scintillation is proportional to the product of the thickness of atmosphere traversed by the ray of light, multiplied into the astronomical refraction due to the altitude of the star.

(3) Besides the variation due to colour, there are differences which seem to be due to some property of the stars themselves.

Professor Dufour pointed out that the second conclusion justified the formation of a table whereby the scintillation of any star at any altitude might be converted into the equivalent for any uniform altitude, such as for example, that of 60° of zenith distance.

M. Montigny at an early date designed an apparatus which brings the rapid twinkling within the scope of easy and accurate measurement. We must refer our readers for the full description and necessary engravings to some of M. Montigny's earlier papers in *Ciel et Terre*—confining ourselves to some stray remarks which even

if not strictly accurate may still afford hints respecting the method. Cost is often a great obstacle to scientific progress, and therefore, heretical though it may be, we take it up first. M. Montigny tells us nothing about it. He says that he uses a 3 inch achromatic—and that is at any rate not a very serious item—it is perhaps not very far from the sized telescope most usually possessed by meteorological observers. His scintillometer, unless we mistake, can easily be so constructed as to become virtually merely an extra eye piece (just like a position micrometer) to such a telescope.* And when the workmen get used to making them we think that from £3 to £5 would probably cover the cost. As to the general principle of the instrument, we are irreverent enough to say that it is a combination of the whirling of a burning stick with that of the trick of rendering a coin visible by pouring water into the basin containing it—the image of the star taking the part of the burning stick, and a rapidly revolving inclined disc of plate glass, that of the water in the basin. The ray of light on its passage from the object-glass to the eye-piece has to traverse an oblique disc of glass $\frac{1}{4}$ of an inch thick, which disc can be made to revolve at any desired velocity, the bending of the ray of light in its passage through the plate glass causes the image of the star to become a disc, and this is only perfect when the rotation of the disc is exactly equal to the frequency of the scintillation.

We have already shown that Professor Dufour considered that there were what may be called personal characteristics attached to certain stars. M. Montigny early applied his ingenious appartus to the investigation of this subject. He selected 41 principal stars, grouped them according to the classification of P. Secchi which was wholly based upon the character of their spectra, and found that the rapidity of the scintillation followed almost precisely the spectroscopic classification—being slowest with stars whose spectra show many lines, and fastest with those whose spectra show only a few principal bands.

The regular observations made at Brussels by M. Montigny date back to 1870, and this series of 14 years forms the basis of the paper the title of which we have already quoted. In it M. Montigny begins by explaining that the indications given by the scintillometer may be divided into three classes.

(1) The intensity of scintillation. This is the most important indication, it gives the number of changes of colour exhibited by the scintillation of the star in a second of time reduced (as already explained) from the observed value to its equivalent at the fixed zenith distance of 60°; we do not see that the author states the average or the extreme rapidity of this scintillation, but from various

* Of course we are not suggesting that position micrometers are usual accompaniments of 3-inch telescopes—we quote them only as fairly equivalent to, though much more costly than, the scintillometer.

parts of his paper we believe that it may be for a minimum, 20 times a second, for the average 75 times, and during a violent tempest, as great as 233 times in a second.

(2) The various characters of the image produced by the scintillometer. This unfortunately can only be reduced to number in as far as the breadth of the image is concerned—but this is a very important feature, for M. Montigny says that he has long observed that the more the image broadens at the approach of rain the longer will the rain last. The circular image which in fine weather is narrow, perfectly regular and sharply edged, presents on the approach of rain thin filaments breaking off from its edges; the next day the image has become broader, and more irregular, its edge being hazy, undulated or even fringed when rain has begun, and dotted or beaded when a cyclone is near. These progressive changes are a positive indication of approaching disturbances.

(3) The colours which are shown to predominate. These seem to be constant for the same star.

The author then proceeds to epitomize the results obtained on upwards of 1,700 evenings, 1870–84. He divides these into 11 groups, and we give as briefly as possible the results he arrives at respecting each. He states that the influence of rain is so great that he discusses it first.

(1) *Intensity of Scintillation according to Seasons.* 1870-84.

	Spring	Summer	Autumn	Winter	Mean
Under the influence of dry weather	58	44	59	71	58
,, ,, rain ,,	78	68	82	103	83
Mean values	70	62	76	93	75
Excess "during rain" over "dry weather"	20	24	23	32	25
,, ,, ,, ,, ,, expressed as per cent of "dry weather"	35	55	39	45	43

M. Montigny contents himself with remarking that in all seasons the scintillation is notably increased during rainy periods, and that this intensity is even more marked in winter than in summer. We are inclined to think that M. Montigny has here fallen into error. At the bottom of his table we have added two lines; the first gives the excess in wet weather, expressed in scintillations, and is doubtless the series of figures which led him to the above conclusion; but the second line gives the ratio of scintillation in dry, and in wet weather, whence it will be seen that though the excess in the number of scintillations is greatest in wet weather in winter, the excess is not relatively so great as in other seasons: probably additional observations will show that the influence of rain is equal at all seasons.

(2) *Influence of the number of rainy days.*

On classifying the evenings of great and of little scintillation, we find that the former, with a mean scintillation frequency of 133, were followed by 86 per cent of wet days, the latter of 31, by only 45 per cent.

(3) *Influence of the approach of rain.*

Scintillation notably increases on the approach, and decreases on the cessation, of rain.

(4). *Influence of the sequence of wet days.*

Scintillation is much greater when there are three successive wet days, *i.e.*, the day of observation and the two following days; and somewhat less so when the day of observation is between two wet days. The average is 80 when it rains on the day of observation and on the following day, but only 66 when the rain follows on the two subsequent days.

(5). *Influence of cyclones.*

Kaemtz has already remarked that scintillation is excessive during times of atmospheric disturbance. M. Montigny states that his researches fully confirm this, and he gives extremely high rates of scintillation (211 and 233) as having occurred during the storms of February 26, 1876, and October 24, 1882. He states that the scintillation gradually increases as the depression approaches, and decreases as it passes away.

(6). *Influence of the approach of rain on the altitude at which the changes of colour in a scintillating star cease to be perceptible.*

According to Humboldt, the arrival of the rainy season in the tropics is announced many days in advance by the scintillation of the stars at high altitudes, although in those regions scintillation is unusual. At Brussels changes of colour are perceptible at greater altitudes before rain than before dry weather.

(7). *Influence of the humidity of the air.*

In order to detect this, it is necessary to avoid instances influenced by approaching rain; this M. Montigny has attempted to do, and he finds that *in dry weather* the scintillation increases with increasing humidity.

(8). *Influence of fog.*

In dry weather scintillation increases when fog will be formed in the evening after observation, but it does not increase if fog will follow the next day or even the next morning. Probably, in the former case, the formation of fog particles has already commenced in the higher regions when the observation is made.

(9). *Influence of snow.*

While the air is full of snow there are sometimes rifts through

which the stars shine. It is found that they then scintillate more than usual, and more than is due to temperature alone.

(10). *Influence of temperature.*

In order to study this, it is necessary to select periods free from the influence of rain. Having done so, the following values were obtained :—

Limits of Temperatnre.	Mean Temperature.	Intensity of Scintillation.	M.T. × I. of S.
77° to 68°	70°·3	39	2742
68 ,, 59	63 ·5	44	2794
59 ,, 50	52 ·3	55	2876
50 ,, 41	44 ·6	60	2676
41 ,, 32	37 ·6	75	2820
32 ,, 23	24 ·8	99	2455
23 ,, 14	18 ·1	103	1864

To M. Montigny's table we have added a column which conclusively proves his statement. The figures are the result of multiplying together the mean temperature and the scintillation; if the one increases as the other decreases the resultant should be nearly constant and (except for the values below freezing point) this proves remarkably the case.

M. Montigny himself seems to have scarcely realized the extreme closeness of the agreement for he does not speak so confidently respecting it, as respecting other conclusions for which evidence of equal strength is not given.

(11). *Influence of wind.*

No numerical values are given under this head, but it is pointed out that the influence of cyclones has already been mentioned as well as that of rain, humidity, and temperature. It is somewhat difficult to eliminate the influence of wind from all the foregoing, but M. Montigny mentions one fact worthy of note. When, on a windy evening, the scintillation of many stars is observed, the scintillation is generally found to be greatest in the path of the wind, *i.e.*, in the direction whence it comes and whither it goes.

M. Montigny concludes with the following paragraphs :—

"From the foregoing remarks it appears that it is the amount of water in the atmosphere which chiefly regulates the frequency of scintillation and modifies its characteristics according as this water is dissolved in vapour, falls as rain, or floats as snow.

"The whole of the facts which I have just epitomized respecting the relations between scintillation and atmospheric conditions form the basis of the application of the scintillometer to *weather forecasting.*

"Let me add that this beautiful phenomenon if continuously and carefully studied will be equally useful to Meteorology itself, by the information which it will afford respecting the influence of the earth's atmosphere on stellar light."

EXTRAORDINARY FALL OF RAIN AND SNOW IN VIENNA, MAY 15, 1885.

We begin this note by reminding our readers that the rainfall of Vienna on the average of 30 years, is (rather less than that of London) 23·43 inches. This will enable them to realize how exceptional must be a fall of very nearly *six inches* in one day.

It is a common fallacy to consider that England has a monoply of bad weather. We reproduce from the *Zeitschrift d. Oester. Gesell. f. Met.* for June, Dr. Hann's note upon May 15th, as a specimen of how uncomfortable Vienna weather can be.

The evening of May 14th, was dark and showery, with heavy black clouds in S.E., temp. at 9 p.m., 49°. In the morning of the 15th (about 6 a.m.) the wind backed to E. and E.N.E., and the rain increased. The barometer continued to fall till nearly noon, the temperature remaining about 50°, and rain falling at the rate of about a tenth of-an-inch an hour. About noon the wind backed through N. to W. and it began to blow a gale, the mean hourly velocity for the following 18 hours being 42 miles, and in several hours exceeding 50 miles—the rain (as will be seen by the following table) not only continued but increased, while the temperature fell nearly to freezing point, and about 6 p.m. the rain took the form of a driving mixture of rain and wet snow, which finally ceased almost precisely 24 hours after it had begun, and yielded the extraordinary total of 5·99 inches.

Dr. Hann says "Es war das gräulichste Unwetter, das man sich denken kann"* and the instrumental records quite confirm his opinion. Six men were frozen to death in the suburbs, and a house fell, partly from the force of the gale, and partly from the weight of snow on the roof, while the damage to trees, crops and cattle was excessive.

Heavy Rainfall at the Centralanstalt, Hohe Warte, Vienna, May 15-16th, 1885.

Hour ending	Rain. in.	Hour ending	Rain. in.	Hour. ending	Rain. in.	Hour. ending	Rain. in.
7 a.m.	·02	1 p.m.	·06	7 p.m.	·36	1 a.m.	·52
8 ,,	·06	2 ,,	·09	8 ,,	·25	2 ,,	·30
9 ,,	·18	3 ,,	·15	9 ,,	·39	3 ,,	·53
10 ,,	·19	4 ,,	·12	10 ,,	·35	4 ,,	·46
11 ,,	·15	5 ,,	·26	11 ,,	·44	5 ,,	·16
Noon	·12	6 ,,	·43	midn't.	·30	6 ,	·10
Totals...	.72		1·11		2·09		2·07

The results of another gauge are given, and therefore treating the above record as that of Gauge A, we give the two records added up for corresponding periods.

*It was the most abominably bad weather that can be imagined.

	Centranstalt. Gauge A. in.	Centranstalt. Gauge B. in.	Agricultural School. in.
May 15th, 0 to 7 a.m.	·02	·06	
,, ,, 7 a.m. to 2 p.m.	·85	·70	
,, ,, 2 p.m. to 9 p.m.	1·96	1·82	
,, ,, 9 p.m. to 6 a.m. (16th)	3·16	2·96	
Gross Total	5·99	5·54	5·85

The gauge at the new Astronomical Observatory was allowed to run over, and therefore became useless.

Dr. Hann remarks that the greatest fall previously recorded was 4·10 in. on the 28th–29th of July, 1882, and that it far exceeded all previous records, the greatest previously having been 2·71 in. on June 30th, 1864, and 2·83 in. on May 16th, 1851

The fact which appears to us the most noteworthy is, that this excessive fall was the product of what must (in spite of its unusual amount) be designated as ordinary rain, *i.e.*, it was not one of those torrential downpours which occur during thunderstorms, and which are variously described as "waterspout," "bursting of a cloud," and so on. It was a *very remarkably prolonged* ordinary heavy rain.

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—I cannot agree with Dr. Muirhead's deduction that the action of the tidal wave, referred to in my letter, is due to the suction of the waters *within* the cyclone area from diminished aerial pressure.

Were this the cause the tide level, on the approach of a cyclone, would rather diminish than increase by the very law which raised the waters within the disturbed area, and an exactly opposite result would be observed until the cyclone was at hand.

The acceleration of the tidal crest in this instance, however, occurs *far in advance of* the mercurial fall, and therefore the Hebrideans, although possessed of good barometers in some places, wisely prefer the warning of tidal level as being certain, to that of the barometer, which, affected by many variable influences, is frequently both slow and deceptive in its action.

The cause appears to me to be due to the increased pressure on the flow and against the ebb of the tide wave, assisted by the flow of the gulf stream, for a considerable distance in advance of an an approaching cyclone, the measure of which, will indicate with certainty, the nature, and to some extent the course, of the disturbance to follow.

Yours faithfully,

G. WOULFE BRENAN, C.E.

Oban, Argyllshire.

ON RELATIVE HUMIDITY AND THE DRYNESS OF THE AIR.

To the Editor of the Meteorological Magazine.

SIR,—Mr. Strachan's letter on the above subject in your June Magazine, will not tend to restore confidence as to the methods adopted for obtaining the relative humidity of the air. The conclusions which I have arrived at are based upon the results of numerous observations and experiments which Professor Tyndall has somewhere called "popping the question" to nature herself. Many of these observations have been witnessed by yourself and others.

I must, therefore, beg to remind Mr. Strachan, that these conclusions are not to be swept away by his preference for one hygrometer or the other, or by any speculation as to the differences which may exist between the temperatures of the inside and outside surfaces of a vessel containing water, the thickness of the sides being about ·01 of an inch. This question is not new to me as will be seen by a reference to my papers on evaporation;* it is a question of which no accurate solution seems possible, but experiment tells me, that the difference is so small as to escape observation. This result is not surprising when it is considered that the specific heat of the water, volume for volume, is more than 3,000 times greater than that of the air by which it is surrounded.

G. DINES.

Walton-on-Thames, July, 1885.

SOLAR HALOS.

To the Editor of the Meteorological Magazine.

DEAR SIR,—On the 22nd of June, about mid-day, I observed a halo of perhaps an unusual type. Two bands were visible, but neither of them was very distinct; the inner one was red, and the outer a blue or violet. It was probably visible for about half-an-hour. I cannot find any instance of one similar to it in my previous records of observation on halos. I may add that I saw two distinct parhelia, and the upper arc of a solar halo at 5 p.m. on June 5th.

Your's truly,

R. MONTAGUE MERCER.

Rodmersham House, near Sittingbourne, July 9th, 1885.

ATMOSPHERIC ELECTRICITY.

PROFESSOR PALMIERI, of the Vesuvian Observatory, has recently published some observations of interest on atmospheric electricity. In clear weather the atmospheric electricity is usually positive, if

* See "Proceedings of the Meteorological Society," Vol. V. (1870) page 205 and 300.

negative a downfall of rain, &c., may be inferred to be going on at some little distance. There is a maximum of atmospheric electricity at 9 a.m., another soon after sunset, which often continues during a great part of the night. A minimum takes place before daybreak, and another in the afternoon. This periodicity is, however, disturbed by atmospheric movements. When the maxima are very pronounced, cloudy weather often follows. If the sky becomes overcast the electric indications grow stronger, and if at the time of the evening maximum the relative moisture increases with a heavy dew, maxima of special duration and intensity may be expected. The assumption that atmospheric electricity becomes stronger with altitude is not borne out by the Vesuvian obervations. Lower potentials are generally observed on hot summer days; in spring and autumn the indications are stronger; in winter they are uncertain. On cloudy days the potential is less intense, but positive; during rain the potential increases. A rain zone is positive but surrounded by a negative zone, which again is surrounded by a zone of positive electricity.* According to Palmieri, there is no thunder and lightning without rain.—*English Mechanic, May* 29th, 1885.

ROYAL METEOROLOGICAL SOCIETY.

THE concluding meeting of this Society for the present session was held on Wednesday, 17th of June, at the Institution of Civil Engineers, 25, Great George Street: Mr. R. H. Scott, F.R.S., President, in the chair.

Lieut. A. Leeper, R.N., was elected a Fellow of the Society.

The following papers were read :—

(1). "A few Meteorological Observations made on a voyage up the Nile in February and March, 1885," by Dr. W. Marcet, F.R.S. The author, on a voyage up the Nile from Cairo to Assouan, made a series of meteorological observations, and in the present paper gives the result of those relating mainly to nocturnal radiation and to the temperature of the water of the Nile.

(2). "The Mean Direction of Cirrus Clouds over Europe," by Dr. H. H. Hildebrandsson, Hon. Mem. R. Met. Soc. The author has collected a number of observations on the movements of cirrus clouds over various parts of Europe, and after discussing them has arrived at the following results :—(1) The mean direction at all stations lies between south-west and north-west; (2) in winter the cirri come from a more northerly direction, and in summer from a more southerly; (3) in winter the northerly component is greater on the Baltic and the north coast of the Mediterranean; (4) the mean directions of the upper currents nearly coincide with the mean

* Just what Andrew Crosse said half a century since, and not only said, but observed the phenomena, and offered an explanation. See *Memorials of Andrew Crosse*, 1857, 12mo., page 134.—*Ed. Met. Mag.*

tracks of storm-centres; (5) the upper currents of the atmosphere tend in general to flow away from those areas in which a barometrical depression exists at the earth's surface towards those in which there is an elevation of pressure.

(3). "On the Influence of Accumulations of Snow on Climate," by Dr. A. Woeikoff, Hon. Mem. R. Met. Soc.

(4). "Note on the Weather of January, 1881," by Mr. C. Harding, F.R. Met. Soc. It will be remembered that the weather of January, 1881, was remarkable for the prolonged and exceptionally severe frost, the heavy gale of the 18th and 19th, and the snow-storms. The author has prepared isobaric charts for the North Atlantic and the adjacent continents for January, 1881, and compared them with similar charts for January in other years. He shows that the severe weather in 1881 was due to a reversal of the normal conditions, the atmospheric pressure being high in the north and low in the south.

(5). "Results of Meteorological Observations made in the Solomon Group, 1882-84," by Lieut. A. Leeper, R.N.

(6). "Graphic Hygrometrical Table," by Mr. D. Cunningham, M. Inst. C.E., F.R. Met. Soc.

CURIOUS RECORD OF A HAIL STORM.

In a very old farmhouse at Biscot, near Luton, Bedfordshire, the following inscription is engraved on an old stone chimney-piece:—"There was hailstones fell July 23, of this bigness and likeness, 1666. T. T." One "likeness" shows a circular stone, half an inch in diameter, another is oval, and measures an inch in length. W. G. S.—*Gardener's Chronicle*, May 9th, 1885.

INTERIOR TEMPERATURE OF THE EARTH.

The German Government is having a deep shaft sunk near Schladebach [between Merseburg and Leipzig], with the object of obtaining various kinds of scientific information, and especially trustworthy *data* concerning the rate of increase of the earth's temperature as we descend into the interior. The excavation is being carried on by a diamond-tipped borer driven by water. As far back as the beginning of this year the shaft had reached the depth of 1,392 mètres [4,567 ft.], which is believed to be the lowest depth yet reached by boring. The temperature at successive stages is ascertained by an ingenious instrument which serves as a special thermometer, the principle of construction being the fact that as the heat increases, the mercury will expand so as to flow over the lip of a sufficiently short open tube in greater and greater quantities. The measurement of the differences of those overflows will give the rate of increase of the temperature. It has been ascertained that the temperature at the depth of 1,392 mètres [4,567 ft. or $\frac{7}{8}$ of a mile] was 49° Centigrade, or 120° Fahrenheit. If the temperature increases regularly at this rate, the boiling point of water ought to be reached at a depth of 3,000 mètres [9,843 ft. or nearly 2 miles], and at 75 kilomètres [47 miles], we should find the heat at which platinum melts. This would go to show that the thickness of the earth's crust cannot be more than about one-ninetieth of its radius.—*The Times.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1884.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	55·7	8	28·5	31	45·9	36·6	37·1	85	66·7	22·2	2·57	17	7·3
Malta	66·2	10*a*	44·6	23	61·9	52·8	50·2	83	109·4	37·9	4·87	15	4·9
Mauritius	86·0	19	66·4	5	83·1	71·2	65·6	71	136·4	57·5	1·56	13	5·4
Calcutta	78·9	28	52·7	10	76·4	56·5	55·6	73	133·2	37·6	·00	0	1·6
Bombay	88·0	10*b*	66·6	23*c*	83·4	68·9	63·5	67	142·1	53·4	1·14	2	2·9
Ceylon, Colombo	89·0	4	69·1	27	85·2	72·9	69·1	71	150·0	63·0	14·30	13	6·0
Melbourne	89·3	31	43·3	1	72·5	52·5	49·0	66	150·6	36·9	3·05	15	6·2
Adelaide	97·6	29	47·9	23	77·1	57·1	47·1	49	160·7	32·5	·96	13	5·1
Wellington	70·0	2	44·3	13	64·2	53·3	.	...	145.0	40·0	12·46	23	...
Auckland	75·5	16	51·0	3	68·6	55·9	53·1	72	144·0	43·0	5·66	19	6·0
Kingston	89·5	1	63·3	29	86·6	67·9	68·5	79	...	58·8	·00	0	2·8
Barbados	80·0	1*d*	69·0	23*e*	78·0	70·0	68·8	80	140·0	...	4·07	10	5·0
Toronto	50·6	31	—13·3	19	31·7	18·8	24·5	83	94·0	—14·0	3·26	17	7·7
New Brunswick, Fredericton	48·8	30	—28·5	28	28·1	8·0	19·2	88	...	...	6·51	17	5·5
Manitoba, Winnipeg	41·3	2	—43·6	23	4.6	—11·5	5·0	94	...	...	1·11	8	5·5
British Columbia, Victoria	54·0	1	8·0	29	...	...	...	...	...	...	1·95	11	...

a And 13. *b* And 18. *c* And 29. *d* And 11, 12. *e* And 24, 25.

REMARKS, DECEMBER, 1884.

MALTA.—Mean temp. 56°·5; mean hourly velocity of wind 11 miles; sea temp. fell from 65° to 62°. TSS on 2 days, H on 22nd and 24th. J. SCOLES.

Mauritius.—Rainfall 3·79 in. and temp. 1°·0 below average; prevailing direction of wind E. and E.N.E. Scarcely any unusual colorations of sky. C MELDRUM, F.R.S.

COLOMBO.—TSS on 3 days, L on 8th and 30th. F. C. H. CLARKE, Major, R.A.

Melbourne.—Mean temp. 2°·2 and temp. of dew point 1°·2 below their respective averages, rainfall 0·69 in. above average, humidity and amount of cloud both slightly above average. Prevailing winds W., S. and S.W. strong on 10 days, heavy squalls on 3 days. TS with H on 7th, L on 14th. R. L. J. ELLERY, F.R.S.

Adelaide.—Remarkable for low pressure, coolness, and the force of the wind. Mean pressure nearly ·10 in. below the average of the previous 28 years, and the lowest on record. The mean temp. (67°·1) was nearly 4° less than the average and the lowest on record since 1856; temp. reached 90° on only 4 days, the average number being 9. The total horizontal motion of the wind, 10,990 miles, was far in excess of any previous record; but notwithstanding the unusually stormy weather, the rainfall was only 0·12 in excess of the mean for the previous 27 years. C. TODD.

Wellington.—Showery weather up to 12th. heavy R being recorded on 5th, 6th and 11th; tolerably fine then until the 23rd; remainder of the month showery, with heavy R, 3·48 in., the max. for the month on the night of 28th. Total rainfall 8·81 in. above the average, number of wet days more than twice the average, mean temp. 2°·5, and pressure slightly, below average. R. B. GORE.

Auckland.—The early portion of the month was unsettled and showery; from 9th to 19th, mostly fine and pleasant, the close of the month variable and showery with occasional heavy TSS. Rainfall greatly in excess. T. F. CHEESEMAN.

KINGSTON.—The rainfall for the month over the whole Island, was less than half the average, rivers giving out, the Llandovery never known to be dry before this year being dry for the 4th time in 1884. MAXWELL HALL.

BARBADOS.—Mean temp. 74°, 1°·1, and rainfall 36 per cent. below the average for 25 years. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	2·19	XI.	Rhayader, Nantgwillt..	2·40
,,	Margate, Birchington...	·84	,,	Carno, Tybrith	2·23
,,	Littlehampton	1·67	,,	Corwen, Rhug	1·72
,,	Hailsham	·72	,,	Port Madoc	2·98
,,	I. of W., St. Lawrence.	2·51	,,	I. of Man, Douglas	1·70
,,	Alton, Ashdell.....	2·02	XII.	Stoneykirk, Ardwell Ho.	·67
III.	Winslow, Addington ...	1·91	,,	Melrose, Abbey Gate...	·74
,,	Oxford, Magdalen Col...	1·67	XIII.	N. Esk Res. [Penicuick]	1·10
,,	Northampton	1 72	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	2·75	,,	Glasgow, Queen's Park.	·80
,,	Wisbech, Bank House..	1·83	XV.	Islay, Gruinart School..	1·94
IV.	Southend	·80	XVI.	St. Andrews, Newton Bk	·72
,,	Harlow, Sheering	1·82	,,	Balquhidder, Stronvar..	1·99
,,	Rendlesham Hall	·85	,,	Dunkeld, Inver Braan..	·68
,,	Diss	·72	,,	Dalnaspidal H.R.S. ...	1·46
,,	Swaffham	1·30	XVII.	Keith H.R.S.	1·48
V.	Salisbury, Alderbury...	1·93	,,	Forres H.R.S.	1·68
,,	Warminster	1·21	XVIII.	Strome Ferry H.R.S....	4·14
,,	Calne, Compton Bassett	1·63	,,	Lochbroom	2·91
,,	Ashburton, Holne Vic..	2·06	,,	Tain, Springfield.....	1·32
,,	Holsworthy, Clawton...	3·04	,,	Loch Shiel, Glenaladale	5·99
,,	Hatherleigh, Winsford.	3·63	,,	Invergarry	2 45
,,	Lynmouth, Glenthorne.	2·25	XIX.	Lairg H.R.S.	2·16
,,	Probus, Lamellyn	2·60	,,	Forsinard H.R.S.	2·30
,,	Wincanton, Stowell Rec.	1·31	,,	Watten H.R.S.	2·55
,,	Wells, Westbury.....	1·13	XX.	Dunmanway, Coolkelure	·65
VI.	Bristol, Clifton	1·73	,,	Fermoy, Gas Works ...	1·73
,,	Ross	2·33	,,	Tralee, Castlemorris ...	1·46
,,	Wem, Sansaw Hall.....	...	,,	Tipperary, Henry Street	·11
,,	Cheadle, The Heath Ho.	3·54	,,	Newcastle West	...
,,	Worcester, Diglis Lock	3·63	,,	Miltown Malbay.....	1·50
,,	Coventry, Coundon	2·38	,,	Corofin	...
VII.	Melton, Coston	1·85	XXI.	Carlow, Browne's Hill..	1·20
,,	Ketton Hall [Stamford]	2·67	,,	Navan, Balrath	1·01
,,	Horncastle, Bucknall ...	2·24	,,	Mullingar, Belvedere ...	·86
,,	Mansfield, St. John's St.	3·71	,,	Athlone, Twyford	·89
VIII.	Macclesfield, The Park.	3·33	XXII.	Galway, Queen's Col....	·50
,,	Walton-on-the-Hill.....	2·18	,,	Clifden, Kylemore	1·83
,,	Lancaster, South Road.	2·04	,,	Crossmolina, Enniscoe..	·54
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	·56
IX.	Wakefield, Stanley Vic.	2·45	XXIII.	Dowra	...
,,	Ripon, Mickley	3·01	,,	Rockcorry.....	...
,,	Scarborough.....	2·84	,,	Warrenpoint	·93
,,	East Layton [Darlington]	2·04	,,	Newtownards	...
,,	Middleton, Mickleton ..	1·59	,,	Belfast, New Barnsley..	1·15
X.	Haltwhistle, Unthank..	1·24	,,	Cushendun	·85
,,	Shap, Copy Hill	1·43	,,	Bushmills	1·11
XI.	Llanfrechfa Grange	2·84	,,	Stewartstown	.71
,,	Llandovery	3·19	,,	Buncrana	·84
,,	Castle Malgwyn	1·92			

JUNE, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max Deg.	Date	Min. Deg	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·99	— ·68	·79	8	11	84·7	4	41·4	11	0	0
II.		Maidstone (Hunton Court)...	1·21	— ·86	·36	8	8	...	...	...	...	...	...
,,		Strathfield Turgiss	1·79	— ·31	·48	16	9	83·1	4	36·4	11	0	0
III.		Hitchin	2·63	+ ·50	1·44	8	11	75·0	4	35·0	10	0	...
,,		Banbury	2·30	— ·14	·77	8	11	82·0	4	37·0	11	0	...
IV.		Bury St. Edmunds (Culford)	·93	— 1·34	·33	8	11	88·0	3	33·0	10*e*	0	...
,,		Norwich (Cossey)	·96	— 1·26	·35	8	8	83·5	4	38·0	11*f*	0	...
V.		Weymouth(LangtonHerring)	1·46	...	·41	5	9	...	...	...	...	...	...
,,		Barnstaple.....	3·62	+ ·90	1·21	23	10	83·5	5	45·0	1	0	...
,,		Bodmin	2·70	— ·51	1·32	23	11	72·0	13*b*	45·0	10	0	0
VI.		Stroud (Upfield)	1·95	— ·43	·37	6 & 8	11	81·0	4	44·0	10	0	...
,,		ChurchStretton(Woolstaston)	3·81	+ ·94	·95	23	11	79·5	4	41·5	10	0	...
,,		Tenbury (Orleton)	2·79	+ ·05	·73	6	10	80·7	4	38·0	11*g*	0	0
VII.		Leicester	2·55	...	·84	6	11	84·5	4	39·2	11	0	4
,,		Boston	2·27	+ ·02	1·10	7	9	87·0	3	40·0	27	0	...
,,		Grimsby (Killingholme).....	3·44	+ 1·07	1·11	8	13	80·5	4	41·0	11	0	...
,,		Hesley Hall [Tickhill].....	2·79	...	·65	6 & 8	9	86·0	4	39·0	2*h*	0	...
VIII.		Manchester (Ardwick).....	3·96	+ ·80	·84	23	12	83·0	4	45·0	11*i*	0	...
IX.		Wetherby (Ribston Hall) ..	3·44	+ ·57	1·15	24	7	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·25	— ·57	·63	18	12	80·0	13	38·0	26	0	...
X.		North Shields	1·62	— ·41	·81	24	9	77·8	12	39·0	10	0	0
,,		Borrowdale (Seathwaite).....	6·15	— 1·66	2·28	18	13	73·7	28	38·5	26	0	...
XI.	WALES.	Cardiff (Ely).....	2·88	— ·18	·95	23	11	...	...	...	...	...	...
,,		Haverfordwest	2·50	— ·53	·60	8	10	73·0	13	40·0	1*j*	0	1
,,		Plinlimmon (Cwmsymlog) ...	3·14	...	·75	22	11	...	...	...	...	...	...
,,		Llandudno.....	·95	— 1·05	·32	6	8	74·0	3	45·2	10	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	·92	— 2·25	·39	18	9	74·0	28	35·4	10	0	...
,,		Jedburgh (Sunnyside).....	·49	— 1·91	·13	28	8	75·0	13*c*	35·0	10*k*	0	...
XIV.		Douglas Castle (Newmains)	·68	— 2·33	...	...	...	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory)	2·69	— 1·15	·75	3	13	...	...	...	...	...	...
,,		Oban (Craigvarren)	2·98	...	·62	18	17	69·5	28	41·5	10	0	...
,,		Mull (Quinish).....	3·49	...	·72	18	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices	·80	— 1·97	·20	19*a*	6	...	...	...	...	...	...
,,		Arbroath	·85	— 1·76	·19	20	8	70·0	3	41·0	10	0	...
XVII.		Braemar	1·23	— 1·86	·49	28	12	71·0	28	32·1	9	0	...
,,		Aberdeen	1·07	...	·39	18	10	77·0	12	35·0	9	0	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	·80	— 1·45	...	...	...	74·0	27	36·0	10	0	3
XIX.		Dunrobin	1·94	...	·42	18	10	72·0	27	38·0	10	0	...
,,		Orkney (Sandwick).....	2·50	+ ·70	·36	18*c*	21	61·4	5	39.5	26	0	4
XX.	IRELAND.	Cork (Blackrock)	1·19	— 2·36	·43	4	6	83·0	28	41·0	5	0	...
,,		Dromore Castle	1·56	...	·50	4	8	70·0	29	41·0	30	0	...
,,		Waterford (Brook Lodge) ...	1·51	...	·55	7	9	71·0	28	38·0	10	0	8
,,		Killaloe	1·58	..	·36	4	10	76·0	28	43·0	26*l*	0	...
XXI.		Portarlington	1·03	— 1·40	·31	7	10	73·5	12	40·0	25	0	...
,,		Dublin (FitzWilliam Square)	1·51	+ ·69	·50	7	8	73·3	3	40·9	10	0	0
XXII.		Ballinasloe	·73	— 2·46	·18	4	9	70·0	11*d*	37·0	6*m*	0	...
XXIII		Waringstown	·77	— 1·89	·15	4	12	83·0	7	35·0	9	0	
,,		Londonderry (Creggan Res.).	1·00	...	·19	2	14	...	...	...	...	...	...
,,		Omagh (Edenfel)	·78	— 2·27	·21	18	10	72·0	28	36·0	5*n*	0	3

a And 20. *b* And 14. *c* And 28. *d* And 12, 13 and 29. *e* And 27. *f* And 28. *g* And 2
h And 10. *i* And 26, 27. *j* And 2, 27. *k* And 26. *l* And 27. *m* And 28. *n* And 22.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON JUNE.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The rains of the early part wonderfully improved the hay crop, which, however, was not heavy; cutting began on 15th. Corn crops and beans doing well; hops favourable and free from aphis. Common blue and meadow brown butterflies flying on 1st; dog rose in flower on 12th; honey-suckle on 18th.

BANBURY.—Mean temp. 57° 5. A favourable month, rains in the early part very useful; haymaking general at the end, in fine drying weather. L on 7th, 14th and 18th; high wind on 18th.

CULFORD.—A very dry month with some very hot days, followed by cold nights. Apple crop very blighted and thin.

LANGTON HERRING.—On the whole a fine month; haymaking during the last week under very favourable conditions; crop heavy. Dense fogs occurred on 5th, 6th and 7th, which with those of the last week in May, blighted the fruit trees to some extent. There were fogs on 19th, 22nd, and 23rd, also.

BODMIN.—Mean temp., 61°·3.

STROUD.—L in North at 9 p.m. on 7th.

WOOLSTASTON.—T and L on 7th.

ORLETON.—Very variable temp., with many bright days and cold nights; very warm till the 5th, then cloudy and rainy till the 11th, fine and warm again till the 15th, after which it was generally cold and stormy to the end of the month. Mean temp. about 0°·8 above the average of 24 years. Prevailing wind N.W. to N.E., frequently rough and cold. All vegetation late, but generally luxuriant. L and T on 7th, L on 13th.

KILLINGHOLME.—The beginning of the month was warm, ; heavy R followed and temp. fell; the nights were cold throughout, checking the growth of root crops; grass and corn crops looking well. Earthquake slightly heard and felt about 11 a.m. on 17th; distant T and L on night of 7th.

MANCHESTER.—On the whole a fine month, but temp. was, with some exceptions, rather chilly, especially at night. Vegetation, however, made great progress, and agricultural prospects are good.

SEATHWAITE.—A severe shock of earthquake was felt at 5·45 a.m. on the 30th.

WALES.

HAVERFORDWEST.—Up to the 13th, fine, warm, growing weather prevailed; a good deal of R fell between the 4th and 8th; after the 14th, temp. was greatly in defect, strong polar currents prevailing. This weather had a very injurious effect on the fruit trees, disappointing the early promise, blossom having been most abundant. The wind on 28th, 29th, and 30th was very violent, with sudden squalls, snapping the gooseberry and currant trees. T and L, with copious R, on the night of 4th. Mean temp. considerably below average; grass temp. on ten nights very low for June.

LLANDUDNO.—A month of bright, very dry weather; mean temp. nearly 2° below average, and the range, both diurnal and monthly, considerably below average; polar winds prevalent. Hay crop unprecedentedly light.

SCOTLAND.

CARGEN.—Notwithstanding more than an average amount of sunshine (240 hours against an average of 230 hours), the mean temp. of the month was 2°·1 below average; the atmosphere, however, was very dry. Vegetation very backward; profusion of blossom on all forest and fruit trees quite remarkable; pears and plums will be a failure as regards fruit.

JEDBURGH.—Though very dry, vegetation progressing greatly. Foliage has not been so luxuriant for many years. The apple and pear crops, which pro-

mised so well in May, have gone on well, and been little affected by caterpillar; the crop is now certain to be abundant. The leaf of the ash has been much behind that of the oak; the hawthorn has not, more than once or twice, for many years, been so luxuriant in this district. It is worth while remarking that the landrail has been little heard during the month in this district, where in former years its cry was almost constant. The mavis, which was thought to have been killed out by the severe winters two or three years ago, has been very plentiful; blackbirds, also, are exceptionally numerous. The gooseberry crop is light. Wind E. or N.E. on ten days.

OBAN.—Decidedly a cold June, with less than the usual sunshine, and frequent showery weather. Hay crop strong, but much requiring sunshine. Inland birds not so plentiful as last year, but wild flowers unusually large and attractive. Two slight shocks of earthquake were felt in this district, but not near Oban. Cloud fogs at sea level were very prevalent; that of the 27th being specially noteworthy, rising and falling on the hill side until finally by the cold N.E. wind in the upper, and S.W. in the lower sky, it was driven into a long stretch of sunlit white cloud of dazzling brilliancy. The phenomenon lasted all day.

QUINISH.—The 27th and 28th were hot days, but the month, as a whole was cold and showery. Vegetation unusually backward.

CULLODEN.—The month was only moderately warm. From 1st to 7th, and 9th to 19th, and then from 22nd to the close, the weather was very dry; crops and pasture land suffering.

IRELAND.

DROMORE.—A very fine month, with very strong N.E. winds at times.

KILLALOE.—Beautiful weather throughout; all that could be desired for early haymaking. Mean temp. 58°·9.

DUBLIN.—A dry, cool, generally fine month. Polar winds predominated, but much warm sunshine modified their searching character. All the rainfall occurred in a few heavy downpours. A striking feature of the month on several occasions was the luminous appearance of strands of cirrus cloud on the northern horizon late at night, and which was clearly due to reflected daylight. There was no sleet or H, nor did electrical disturbances occur near Dublin. An aurora borealis was seen on the night of the 9th; solor halos on 6th and 10th; fog on 1st and 7th. Mean temp. (54°·8) 1°·8 below the average; colder than any June for 20 years, except 1882, when the mean temperature was 54°·7. In 1869 and in 1879, the celebrated cold year, the mean temp. (54°·9) very closely approximated to that of June, 1885. Mean humidity 74; mean amount of cloud 5·1; prevailing winds N.E., N.W., W.S.W.

WARINGSTOWN.—Very dry but not warm.

EDENFEL.—Bright fresh and charming weather, excellent for haymaking, but much too dry for all other crops. Rainfall the smallest, except 1865, for 21 years. Frost on 3 nights, doing much damage to low-lying potatoe fields; this has not occurred here before within the above-named period.

ERRATA IN THE METEOROLOGICAL MAGAZINE 1884.

REGULAR TABLE.

Hunton Court, August,	*should be*	·91	Culloden, March, *should be* ...		1·37
Barnstaple, October,	,,	3·98	Edenfel, April, ,, ...		1·38
,, November	,,	2·98			

SUPPLEMENTARY TABLE.

Birchington, February,	*should be*	1·44	Walton-on-the-Hill, July,	*should be*	4·30
Stowell Rect., December,	,,	3·43	Nantgwillt, December,	,,	10·31
Coundon, March,	,,	2·39	Carrick-on-Shannon, Jan.,	,,	4·71
,, April,	,,	2·00			
,, November,	,,	1·84			

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

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"THE TIMES" ON THE DROUGHT AND ON THE RAINFALL ORGANIZATION.

[ONE of the difficulties attaching to my position is that of deciding when, and whether, any particular notice of rainfall work should be reprinted. If I do reprint notices favourable to it, I lay myself open to criticism for conceit, for "blowing my own trumpet," &c. If I do not reprint them, the encouragement to my correspondents and helpers which these comments offer reaches only those who see the originals –does not reach more than a portion of those observers without whose help my work would abruptly terminate.

The observers and I are mutually dependent; the staff would hardly have reached what it has without me, and I could have done little without the staff; therefore any favourable (or unfavourable) remarks must be shared between us, and on the whole I believe that it is my duty to run the risk of being called conceited, and, when the organization receives praise—and along therewith useful information is given, I think that it is right to give it as wide a circulation as possible.—G. J. S.]

ANOTHER DROUGHT.

To the Editor of the Times.

SIR,—Before submitting a few facts respecting the extremely dry July which has just closed, it will be well to look back a few years and recall our recent experience.

Rainfall observations have now been made uninterruptedly in this country for 160 years, not, alas! at any one place, but by careful calculation I have obtained values which are, I believe, very near the truth for every year from 1726 to 1885. During the whole of this long period there is no instance of more than five consecutive years being wet until we come to recent years, and then we have the unprecedented fact of nine consecutive years (1875 to 1883), each wetter than the average; in short, the quantity in those nine years was as great as usually falls in ten years and a quarter.

In 1884 (just as in 1834, 1844, 1854, 1864, and 1874) the fall was below the average, and complaints of drought and of deficient water supply immediately

arose. As I have dealt with this subject elsewhere, it is unnecessary to do more here than recall the recollection of the complaints in 1884.

I have not had time to thoroughly examine the records of the early months of 1885, but my impression is that up to the middle of June the fall did not differ materially from the average, but the latter half of June was very dry.

I now come to July, which has been so remarkably dry, that I am sure the facts will be examined with interest. I append them in the form of a table, with, at the end, notes by some of my correspondents. How much I am indebted to them it is needless for me to point out.

I am, Sir, your obedient servant,

G. J. SYMONS, F.R.S.

62, *Camden Square, N. W., Aug.* 3.

Rainfall in July, 1885.

County.	Station.	Average in July, 1870-79.	July, 1885.	Deficiency.
		in.	in.	in.
Middlesex	London, Camden Square	2·47	0·52	1·95
Kent	Maidstone, Hunton Court	2·04	0 21	1·83
Kent	Hythe	2·46	0 47	1·99
Hants	I. of Wight, St. Lawrence	2·48	0·70	1·78
Hants	Strathfield Turgiss	2·30	0·22	2·08
Herts	Hitchin	2·70	0·10	2·60
Bucks	Newport Pagnell	2·70	0·14	2 56
Norfolk	Swaffham	3·44	1·10	2·34
Wilts	Salisbury, Alderbury	2·75	0·16	2·59
Devon	Okehampton	3 42	2·07	1·35
Devon	Holsworthy	3 23	1·14	2·09
Gloucester	Clifton	3·25	0·97	2·28
Lincoln	Ulceby, Killingholme	2·78	0·66	2·12
York	Skipton, Arncliffe	4·95	1·43	3·52
Northumberland	North Shields	2·55	1·59	0·96
Monmouth	Newport, Llanfrechfa	3·69	0·71	2 98
Kirkcudbright	Cargen, near Dumfries	3·13	2·68	0·45
Kinross	Loch Leven	3·05	1·00	2·05
Forfar	Arbroath	2·64	0·79	1·85
Cork	Black Rock	2 84	1·32	1·52
King's County	Portarlington	2·68	1·26	1·42
Galway	Ballinasloe	2·88	2·75	0·13
Down	Waringstown	3·58	1·85	1·73

REMARKS.

HITCHIN.—The driest month since the record was begun, in 1849.
HOLSWORTHY.—The driest and finest month for many years.
ULCEBY.—A very dry month, some very hot days, but no thunder or lightning.
NEWPORT, MON.—Very hot until 28th.
CARGEN, DUMFRIES.—First half cold, second half unusually warm. Swarms of aphides.
WARINGSTOWN.—The finest haymaking season in my recollection.

G. J. S.

Leading Article in "TIMES," *of August 5th*, 1885.

"Mr. G. J. Symons writes to us this morning on a subject which is daily becoming of more serious and alarming importance. For six weeks the British Isles have been suffering from what may now be called a drought. Last year was very dry, and 1885 threatens to be drier still. During the nine previous years the country had been complaining of an excess of moisture. Rainfall observations, Mr. Symons says, have been compiled, though not

always very methodically, for a hundred and sixty years. He is in possession of statistics, more or less complete, for that long period. In the whole of it there had been till 1875 to 1883 no instance of a series of more than five wet years. Nature maintains her averages, after a somewhat rough fashion; and it appears as if the balance were about to be redressed by as extraordinary a continuity of drought. Not only here and there has the absence of rain been felt. There will always be localities which, by some accident of the geographical features, as, for example, the vicinity of more attractive hills and woods, are left occasionally unvisited by showers. Last year and this the experience has virtually been universal. South and north, east and west, have vied in dryness. Down has been parched proportionately as much as Middlesex. Monmouthshire has been as rainless as Hampshire. The barometer itself does not seem to have known what to make of the weather. It has constantly been promising relief, and has as regularly failed to keep its pledge. Some slight showers fell yesterday, [Aug. 4th], but there is no security that they are the advance guard of the downfall we need. America has so often failed to send us her storms, that it is impossible to be sanguine that the cyclone which has just done so much damage across the Atlantic will bring rain to our own fields. Our need is very great. Wells half emptied by the demands of last year are positively dry in many quarters now. Water refused by the clouds has been imperatively needed for cattle and gardens, and has had to be fetched, often from great distances. Nobody can tell how the kingdom will fare unless the clouds descend. The fear is that they may reserve their bounty until it will be like the shower of gold on Danae's head, and kill the harvest it is wanted to enrich.

"Want of rain is reducing the meadows to the apparent condition of a Board school playground. It burnt up the strawberries, and keeps the apples thin and withered. It is attenuating the straw and grain in the cornfields. Under its influence a premature autumn is settling down upon the foliage. Yet agriculturally there are compensations. A drought gives a light hay crop double sweetness and nutritiousness. Grain is better for being roasted than for rotting. If roots offer at present a most lugubrious appearance, they enjoy wonderfully recuperative properties. They are not of a sensitive temper like wheat and grass. They do not sulk and refuse to drink because the clouds have deferred their hospitality. Weather lore always cuts both ways. If "a wet August never brings dearth," so too "a dry August and warm doth harvest no harm." Though certainly a dry August would be more beneficial had a moderately wet July preceded, there is hope still for agricultural prospects, looked at from an exclusively agricultural point of view. In a country like the United Kingdom, which from its insular situation has an atmosphere never utterly destitute of a share of moisture, a state of things such as prevailed before 1884 is alone altogether irremediable. This is the more worth recollecting that the other than purely agricultural grievances of a drought are of an extent to require every consolation which can by any ingenuity be imagined. Want of rain causes innumerable inconveniences, some slight, some considerable, and all most irritating. Water is so entirely a necessity that a dearth of it is resented as an actual cruelty. Englishmen expect to have enough of it to waste as well as use. They cannot endure to be allowanced in respect of water more than of air. In ordinary circumstances, the largeness of the normal British water supply is not in the least appreciated. As soon as it begins to

fall off, an Englishman recognizes at every turn by a succession of shocks how marvellously unpleasant it is to be stinted. Individuals speedily find themselves personally incommoded in the country and in the smaller centres of population the moment that a drought has declared itself. It is no light matter in a country house to discover that the cisterns are all but empty and to watch the neighbouring stream declining into mud. When a river like the Thames is so exhausted that Bank holiday excursionists afloat incur at all events no danger of drowning, smaller currents may be supposed to have disappeared altogether. In places such as London a drought manifests its effects in a worse though less direct way. Townsmen need rain not merely to supply the water they drink and wash in, but as a master scavenger. Occasional deluges are the sole adequate instruments for cleansing cities like London and Manchester, Glasgow, and Liverpool. After a period of dry weather humanity in masses is as refreshed by a copious downpour as vegetation. The most casual observer cannot walk through the town, its wealthy as much as its squalid quarters, after an interval of good steady rain without a consciousness of a stir and renewal of life. He is no longer afraid to open his nostrils to the breeze. The air has been washed; and he can perceive the effects on the whole population. Should cholera invade the kingdom, it may sincerely be hoped that at any rate it will delay its arrival until the clouds have finally decided to descend. Its attacks will be resisted with a vastly increased probability of success if the land can first have indulged in a plentiful bath. Rain cannot come too quickly both for the purposes of health and for those of agriculture. Except on some early ripening land, rain not abnormally heavy would not hurt the crops, and might swell the ears. For sanitary considerations its prompt advent is all-important. No urban inspector of nuisances approaches it in efficiency. Not merely does it infallibly detect them, but it abates them of its own authority by one and the same act.

"No means have been, or are likely to be, discovered for compelling the clouds to fall, unless at their own good pleasure, or for dispensing with the supplies they bring. Man, however, is not equally helpless in the distribution of their contents. He can so regulate them that the superfluity of one season shall compensate the deficiency of another. When a sufficient period is taken the kingdom can be shown to have just the amount it needs. Unfortunately, the superabundance is a trouble, and not an advantage, when no sufficient arrangements exist for spreading it over the lean dry seasons. Englishmen have been tempted, by the ease with which in general they obtain from nature all the water they need, to take much less pains than less favoured populations about water storage. An Egyptian peasant, if his fancy could be made to comprehend the golden flood which in Great Britain for many months of the driest years is let roll unheeded into the narrow seas, would think a British farmer the most unreasonable of beings for grumbling at a water scarcity in June and July. A proper system of reservoirs would put an end to many of the evils and burdens which rural England sustains from periods of drought like those of 1884 and 1885. Formerly the topic of the national water supply was involved in inextricable obscurity from the absence of statistics. Mr. G. J. Symons has been foremost in dispelling the darkness. He has devoted a laborious life to the scientific collection of the particulars of the British rainfall. He has brought order into the chaos of the past. At the head of an army of reporters of all ranks, from the Speaker and the Secretary of State for War to

humble clerks, he has rendered it extremely hard for a single shower in these islands to elude his census. His annual summaries of the "Distribution of Rain over the British Isles," as observed at more than two thousand stations, since 1860, compose a library full of the most valuable instruction, both sanitary and agricultural. The volume for 1884 (Stanford and Simpkin, Marshall, and Co.) has just been published, and is of especial interest owing to last year's drought and thunderstorms. In a season like this, when the land is crying out piteously with thirst for the water it let not long ago run in unregarded floods into the sea, Mr. Symons's volumes would be rather melancholy reading, if the superabundance they record did not point to a mode of correcting the defectiveness with which nature is in the habit of balancing it."

[We have been favoured with several valuable letters respecting the drought, which we shall have the pleasure of inserting next month.—ED.]

THE DROUGHT AT BASLE IN 1884.*

THIS pamphlet is noticeable chiefly for the details which it gives respecting the deficient rainfall of 1884. Dr. Riggenbach begins his remarks by describing it as the driest year since observations were begun in 1864, and as having four inches less rain than that year; in fact the total fall was only 19·40 inches, and as the average (20 years) is 32·25 it was 41 per cent. below the average, there was only one month, September, which had more than the average. Both as regards number of rainy days, and especially as regards quantity, 1884 must be considered as extremely dry, yet (excepting in March) there was no long rainless period during the year.

This long-continued short supply of rain caused a general diminution in wells and streams. The so-called "Hungerbäche" near Riehen and Liestal, which during the recent wet years had been in flood, dried up. Around Pruntrut on the northern slope of the Jura there was great want of water, and in Seltisberg, situated on an isolated plateau, the inhabitants had to buy it. The level of most of the lakes fell considerably; at Rapperswill on the Lake at Zurich, the boats could not get into the harbour. The bed of the Emme at Burgdorf was dry. At Aarburg, the Aar was lower than it had been since 1753.

The following are a few of the leading numerical data.

Temperature.		*Various.*	
Absolute max. : July 19th	95°·0	Mean humidity	80
Mean ,,	5·88	,, cloud	6·3
Yearly mean	49·9	Total rainfall	19·40 in.
Mean min.	43·2	Days with rain	167
Absolute min. . Dec. 1st	16·7	Prevailing wind	S.E.

* Witterunsbericht des Jahres 1884, Von A. Riggenbach. Basel J. G. Bauer, 1885. Excerpt Verhand. d. Naturf. Ges. in Basel VII Theil 3 Heft.

DROUGHT AND WEATHERCOCKS.

THERE are probably few who read the above title who can guess why we have chosen it.

The connection does not always exist; some weathercocks are entirely independent of drought or floods, and some are very seriously affected; the former are those which do not carry any of the usual letters N, E, S, W, or which are wholly of metal, and carried on metal or stone supports.

The weathercocks which suffer from drought are those which have the cardinal points indicated by the letters, and which (though themselves of metal) are carried at the summit of a tall pole. The pole, under the influence of sun and drought, splits, and the cracks run *nearly* along its length, but not precisely; they are slightly inclined, and all run parallel; if the drought is prolonged, they become numerous, and, though no *one* crack may be a tenth of an inch, the aggregate amount becomes large. We have ourselves measured one of which the letters were, during the July drought, carried round 44°; the S letter was carried round until it pointed almost exactly S.W. With subsequent moisture the cracks have partly closed, and possibly by November the letter S will be nearly back in its true position, but as to this we have no knowledge.

It is evidently necessary for observers to watch for the occurrence of this somewhat strange error.

THE INFLUENCE OF FORESTS ON CLIMATE.

The third number of *Petermann's Mittheilungen* for this year contains an article by Herr A. Woeikof on the influence of forests on climate. The commencement of a scientific investigation of this subject was made when the Bavarian forest meteorological stations were established, and when Prussia, Alsace-Lorraine, France, Switzerland, and Italy followed the example. As a general rule it may be laid down that in the warm seasons, as between forests and places close at hand which are treeless—1. The temperatures of the earth and air are lower in the former; 2. Their variations are less; 3. The relative humidity is greater. After examining observations as to evaporation, Herr Woeikof states that the influence of forests in diminishing evaporation from water and the soil is so great that it cannot be accounted for alone by the lower temperature of the hot months, the greater humidity, or even by the shade. An important influence, which has hitherto been but little appreciated, is the protection from the wind afforded by the trees, and this the writer regards as more important than all the others together in reducing the degree of evaporation. With regard to the influence of forests on rain and snowfall, there is as yet only a single series of observations supplying comparative statistics, and extending over a sufficiently long period. These were taken in the neighbourhood of Nancy, and they show an important influence of forests in increasing the rainfall.

It might appear that the effect of forests on rain in the climate of Central Europe in winter would be small, for the difference between the temperature

and humidity of the forest and the open is very little, and the quantity of moisture in the atmosphere is small. But the observations show that it is at this time of the year that forests get much more rain. This the writer attributes to the clouds being lower, the resistance which the forest offers to the movement of the air, and to the moist west wind. Forests retain rain by the undergrowths of grass, moss, &c., much better than open ground, and let water off superficially only after a heavy rainfall; the remainder filters upwards slowly, and much of it is used for the evaporation of the trees. Although forests, especially thick luxuriant forests, cannot exist without certain supplies of moisture, yet it is the same to them when the supplies come, for they retain what they get, and use it over a long period. One example of this is the Lenkoran forest on the west coast of the Caspian, where the vegetation is more luxuriant than in any other part of Europe, yet very little rain falls in summer, but the rainfall in autumn and winter is great. The water is stored up by the forest, and is used in evaporation during the heat of summer. Humidity of the atmosphere, however, is not inconsistent with a high temperature, as the Red Sea shows; but in forests the humidity is due to the evaporation of the leaves—in other words, to a process by which heat is converted into work, and hence the coolness.

Herr Woeikof then endeavours to ascertain the influence of forests on the climatic conditions of their neighbourhoods in the western parts of the Old World, between the 38th and 52nd degrees N. latitude, the places selected being in all cases in the open. Thus for the 52nd degree eight stations are taken between Valentia in Ireland on the west and the Kirghiz steppes on the east; for the 50th, Guernsey on the west, Semipalatinsk on the east, and thirteen stations, and so on for each two degrees of latitude to 38°. The general result of the observations in fifty stations in six different degrees of latitude is that in Western Europe and Asia large forests have a great influence on the temperature of places near them, and that by their influence the normal increase of temperature as we travel eastward from the Atlantic Ocean to the interior of the continent is not merely interrupted, but they give places far removed from the coast a cooler summer than those actually on the sea. A striking example of this is Bosnia. An examination of the statistics shows—1. That in Bosnia the summer is 2°·5 to 4°·5 cooler than in Herzegovina; 2, Even on the island of Lissa, in the full influence of the Adriatic Sea, the summer temperature is more than a degree higher than that of Bosnia, which is separated by lofty mountain ranges from the sea. Bosnia owes this comparatively cool summer to its great forests, whilst Herzegovina is almost disafforested. To sum up: forests exercise an influence on climate which does not cease on their borders, but extends over a larger or smaller adjacent region according to the size, kind, and position of forest. Hence man by afforestation and disafforestation can modify the climate around him; but it is an extreme position to hold that by afforestation the waste places of the earth can be made fertile. There are places incapable of being afforested, which would not give the necessary nourishment to trees.—*Nature.*

HEAT AND DRYNESS OF JULY 26TH.

To the Editor of the Meteorological Magazine.

SIR,—I do not know whether the following thermometer readings are remarkable, but as I fancy it is not often that in England the difference between dry and wet bulb readings amounts to between 18° and 19°, I send them. The 26th was the hottest day we have had here since I began observations in 1882, the next having been the 8th of August, 1884, when the max. was 84°·9. I kept the house comparatively cool by shutting doors and windows and pulling down blinds, and the feeling, when the door was opened to go out, was that of facing a furnace. After 3 p.m. the sea breeze began to have some effect, till the land breeze again set in, as it did immediately after the calm at 6 p.m., and then for a time the air became drier, till radiation began to cause the formation of dew.

The thermometers (by Casella) are fine and sensitive instruments with cylindrical bulbs and long scales, graduated to fifths of a degree so as to be easily read. I have had them some 25 years and they were last verified at Kew in September, 1881, and so I fancy are as correct as can be. They are in a Stevenson's screen placed on a small plot of grass in the kitchen garden, which has the sun all day at this time of year, excepting for a short time after sunrise and before sunset.—Yours very truly,

R. H. BARNES.

Heatherlands, Parkstone, Dorset, July 27th, 1885.

Temperature, &c., at Parkstone, near Poole, Dorset, July 26th, 1885.

26th July, 1885.	Dry Bulb.	Wet Bulb.	Dew Point.	Relative Humidity.	Wind.		Cloud.	
					Direction.	Force.		
	°	°	°					
7 a.m.	68·2	62·9	58·7	72	N.N.E.	1 to 2	0	Dew.
9 ,,	77·5	68·1	61·6	58	,,	,,	,,	
11 ,,	84·4	68·2	57·5	40	,,	,,	,,	
1 p.m.	87·1	70·1	59·2	39	S.S.E.	1 to 2	1	
1.20 ,,	85·7	67·7	56·0	37	,,	,,	,,	
1.25 ,,	86 4	67·5	55·3	35	,,	,,	,,	
2.15 ,,	88·0	69·5	57·7	36	,,	,,	,,	
3 ,,	86·7	69·1	57·7	38	S.S.W.	1	1	
4.35 ,,	84·4	71·8	63·5	50	,,	,,	,,	
6 ,,	80·8	69·9	62 5	54	Calm.	0	0	
7.15 ,,	76·6	63·7	54·6	47	N.N.E.	1	0	
9 ,,	69·0	62·3	57·1	66	,,	,,	,,	Slight dew.
11 ,,	62·7	59·3	56·4	80	N.N.E.	0 to 1	0	Slight dew.

P.S.—Max. in screen, 88°·0; max. in sun: black bulb, 125°·9, bright bulb, 97°·8 (enclosed in glass jacket).

ATMOSPHERIC ELECTRICITY.

To the Editor of the Meteorological Magazine.

SIR,—Noticing a reference in your current number to the subject of atmospheric electricity, it occurred to me that you might be interested to know of some experiments in that regard which have been tried here. The collecting sources are two—

(1) A long cane carrying a brass ferule armed with three fine platinum points, elevated some 30 feet above the ground, on a building situated near the Observatory.

(2) A tower situated on a rounded eminence, 620 ft. to the N. of the Observatory, its base being 55 ft. above it.

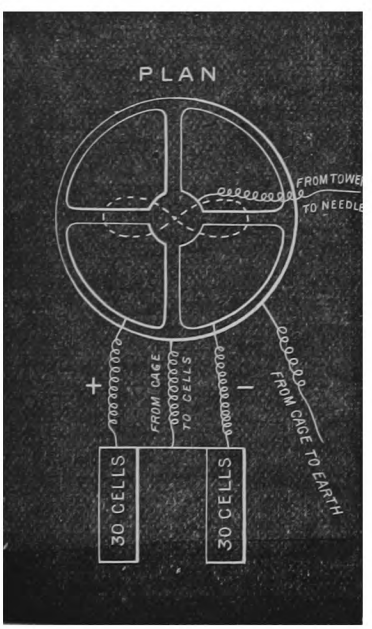
The conducting wires are of copper, gutta percha covered, and are led into the Observatory. The cane on the building is insulated, by being divided by a vulcanite stem protected by a copper funnel, the wire passing inside the upper half.

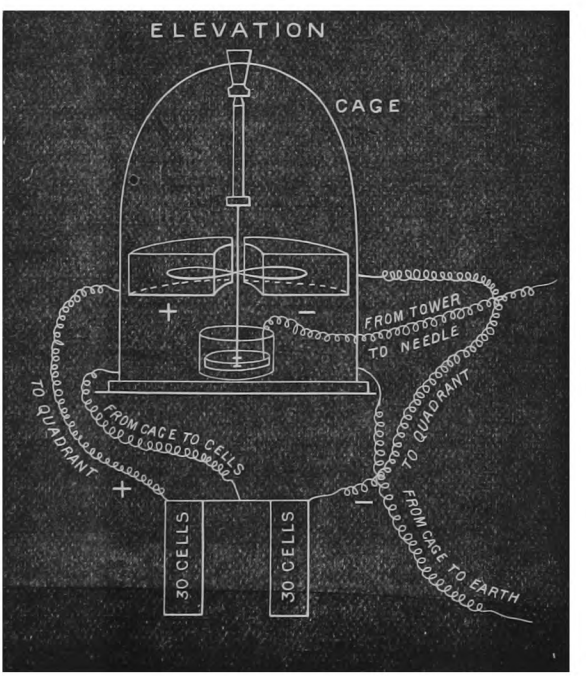
The pole on the tower terminates in a corona of 25 platinum points, and this is insulated by being placed on a glass rod, which runs through a Mascart bottle filled with sulphuric acid. The corona is about 30 ft. above the base of the tower.

The receiving apparatus is of three sorts—

(*a*) A Bohnenberger electrometer composed of a single gold leaf suspended between the opposite poles of two Zamboni's piles.

(*b*) A pith ball electrometer, consisting of two gilded pith balls suspended in contact by fine platinum wires.





(*c*) A Thomson quadrant electrometer of simple form, in which the ordinary arrangement is reversed, the needle being used to test the wire, while the opposite pairs of quadrants are kept permanently charged by two of De La Rue's chloride of silver batteries of 30 cells each, connected at centre to earth.

The needle carries a mirror, and the deflections are read off on a scale in the usual way. The instruments are usually examined at 9 a.m., and specially as occasion offers.

The Bohnenberger is the most sensitive, and is affected by small currents. The pith balls are used as these are found stronger. The quadrant is employed for measurement of quantity and duration of current. Generally the lower points are found to give stronger indications than those on the Tower, which I attribute to the greater resistance in the longer length of wire.

In calm weather the electricity is usually feeble and Positive. In broken weather Negative electricity is oftener developed; but sometimes the sign changes rapidly. On one occasion at least I have found the upper and lower points of opposite signs simultaneously. As a shower of rain or hail comes on, the current strengthens, and sparks now and then fly from the wires. Once my assistant obtained long ones from the wire, and rapid discharges from a pint Leyden jar, coupled up to it. The quadrant arrangement seems a useful one, as avoiding the need of a "replenisher," and as affording a constant charge; and I have every reason to be satisfied with it.

I have not at present examined and arranged the results obtained since the apparatus has been at work, but I hope to do this shortly in connection with the general meteorological observations taken at the same time. We seldom get heavy storms, as they are apparently broken up by the Hogs' Back and opposite hills; and cases of lightning injury are rare. I have not yet tried a small captive balloon, but probably valuable results might be had by thus extending the exploring height. The observatory (51° 13′ 39″·2 N.; 0° 28′ 47″ W.) faces south on the spur of the Hogs' Back, and is 150 feet above Guildford town, and 250 feet super mare. Booker's Tower is marked on Ordnance Map, B M. 305 ft. 5 in.

J. RAND CAPRON.

Guildown Observatory, July 18th, 1885.

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—Supposing that you do not approve of long discussions, I, in reply to Mr. Brenan's rejoinder in last *Meteorological Magazine*, beg merely to remark that I made no reference to, because I do not believe in, *suction* either at sea or in a common pump.

When we get satisfactory proof in favour of the statements advanced in Mr. Brenan's last two paragraphs, I shall be forced to change my views.

HENRY MUIRHEAD, M.D.

Cambuslang.

THE LONDON THUNDERSTORM OF JULY 13TH.

A very local heavy rain occurred about 9 p.m. on July 13th. We have not heard any evidence proving that the fall could claim an entirely exceptional character, but there can be no doubt that, for a short time, very heavy rain fell. Unfortunately there is no self-recording rain gauge within the City boundaries, and the only one in London is that at Camden Square, two miles and a half N.W. of St. Paul's. There are three ordinary rain gauges in the City, and the total collected by each was as follows :—

St. Luke's, Old Street, E.C., 1·19 in. (the storm lasted from 9 to 9.30 p.m.)
The Guildhall, E.C., 1·24 in.
The Guildhall, E.C., 1·18 in. (this gauge is 51 feet above ground.)

Of non-instrumental records—*i.e.*, verbal statements—the strongest are—"In Queen Victoria Street, E.C., the rain fell faster than the gutters could carry it away, so that even in well-built premises it overflowed the gutters, burst through the roofs, and ran downstairs;" and, "A considerable portion of Farringdon Street, long after the storm, was impassable to foot passengers."

At Camden Square there was a mere shower; the total fall was only ·07 in., and the Casella recording gauge shows that it began at 8.20 p.m., mostly fell before 9, and ceased entirely at 9.15 p.m.

The following list gives such metropolitan records as have been received. Stations in the usual order :—

	in.		in.
Lansdowne Crescent, W.	·02	Camden Square, N.W.....	·07
S. Kensington (Inventions Ex.)	·09	Camden Road, N.	·22
Guildhall, E.C.	1·24	58, Clapton Common, N.	·30
,, (Roof)	1·18	Brixton (Acre Lane)	·00
Old Street, E.C	1·19	Greenwich (Royal Obs.)	·06
Regent's Park (Roy. Bot. Soc.)	·24		

A RAILWAY TRAIN OVERTURNED BY WIND.*

(Wochenschrift des österreichischen Ingenieur- und Architekten Vereins, 13th December, 1884, p. 336.)

A TRAIN consisting of nine vehicles left Vienna at 6.30 a.m. on December 10, 1884, by the Vienna and Auspang line. Near the Biedermannsdorf Station the last four vehicles were blown off the line, and thrown down an embankment 5 yards high; as the coupling gave way the rest of the train remained upon the metals. Three of the vehicles blown off were passenger carriages, and the fourth was a goods van; the former weighing about 8·3 tons each, and the latter about 5·9 tons. The surface exposed to the wind was 161 square ft. in the case of the passenger carriages, and 178 square ft. in the case of the van. The leverage of the wind pressure may be taken at 6 ft. 7 in., which gives 43·2 lbs. per square foot for the passenger carriage and 27·9 lbs. per square foot for the goods van, as the wind-pressure necessary for over-turning. W. B. W.

* Foreign Abstracts. Inst. C.E. 1885.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	53·3	29	22·8	22	41·0	32·2	33·2	88	67·1	16·8	1·43	16	8·1
Malta	65·5	17	40·7	21	57·8	47·2	44·9	81	117·2	33·8	4·28	14	4·1
Cape of Good Hope	102·0	28	52·5	8	85·0	61·7	...	...	...	...	·42	1	2·5
Mauritius	86·0	18	69·2	4	83·3	73·7	70·1	78	140·0	60·3	6·70	16	6·4
Calcutta	83·0	28	51·8	7	78·5	57·7	56·6	73	137·5	37·4	·42	1	1·4
Bombay	84·8	23	61·6	11	81·2	67·4	65·1	72	138·3	51·2	·00	0	0·7
Ceylon, Colombo	90·0	20*a*	68·8	2	88·0	72·2	66·4	63	146·5	60·0	1·74	7	4·9
Melbourne	98·4	12	42·0	28	76·7	53·7	51·2	64	156·4	30·2	·75	3	4·8
Adelaide	98·4	3	48·6	18	84·2	57·5	47·6	43	156·2	39·2	·23	3	2·8
Wellington	72·3	18	46·0	13	67·2	53·4	...	...	147·0	40·0	1·85	12	...
Auckland	77·0	20	50·0	14	71·4	57·4	52·3	65	143·0	42·0	1·91	9	5·8
Jamaica	89·5	14	61·3	10	85·4	67·3	67·4	78	...	54·2	·11	...	2·9
Barbados	79·0	var.	67·0	var.	78·0	69·0	68·3	78	140·0	...	2·73	18	5·0
Toronto	44·2	6	−16·1	22	24·3	9·9	16·0	80	103·0	−17·0	2·79	19	...
New Brunswick, Fredericton	45·9	1	−22·5	31	22·9	0·3	11·8	84	...	...	4·05	15	5·2
Manitoba, Winnipeg	35·0	4	−46·0	1	−3·1	−23·3	−4·0	97	...	...	·23	3	2·5
British Columbia, Victoria	54·0	31	22·0	11	42·1	32·7	...	...	...	...	9·15	14	...

a And

REMARKS, JANUARY, 1885.

MALTA.—Mean temp. 51°·8; mean hourly velocity of wind 11·1 miles; sea temp fell from 63° to 60°. TS on 16th, H on 8th and 16th, slight fog on 22nd. J. SCOLES.

Mauritius.—Rainfall ·66 in. above, and temp. 0°·4 below average; mean hourly velocity of wind two miles below average; extremes 28·1 miles and 1·9 mile, prevailing direction E. to E.N.E. T on six days, L on six days C. MELDRUM, F.R.S.

COLOMBO.—TSS on 28th and 29th, and L on seven other days. J. H. SYMONDS.

Melbourne.—Mean temp. of air 2°·0, and of dew point 1°·5, and rainfall ·97 in. below average; humidity average, pressure slightly above, and amount of cloud slightly below average. Prevailing winds S. and S.W., strong on three days. T on one day, L on two, heavy dew on two. R. L. J. ELLERY, F.R.S.

Adelaide.—One of the most remarkable summers ever experienced. In January the shade temp. did not once reach 100°, and on only seven days did it reach 90°, while in December it exceeded 90° on only four days; the mean temp. of both months was nearly 4° below the average. Pressure slightly above average, the max. (30·409 in.) being the highest on record for January. A severe storm traversed the northern portions of the Colony during the latter part of the month, accompanied by heavy rains, which caused floods and considerable damage. C. TODD.

Wellington.—On the whole fine, though showery in the early part; ·59 in. of R fell on 13th, the max. for the month. Prevailing winds S.E. and N.W., stormy on 7th and from 23rd to 27th. Rainfall 1·34 in., and mean temp. (60°·3), 2°·6 below average; pressure slightly above average; earthquake on 15th. R. B. GORE.

Auckland.—On the whole a fine month with small rainfall; pressure above the average, mean temp. below it. T. F. CHEESEMAN.

BARBADOS.—Rainfall 40 per cent. below average, ·56 in. on the 3rd being the max. fall; mean temp. (73°·3) 6°·3 below average; pressure steady. Prevailing wind N.E., mean hourly velocity 11·4 miles, extremes 16·7 miles and 2·5 miles. Four days cloudy and showery. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	·55	XI.	Rhayader, Nantgwillt..	1·26
,,	Margate, Birchington...	·27	,,	Carno, Tybrith	1·48
,,	Littlehampton	·36	,,	Corwen, Rhug	1·09
,,	Hailsham	...	,,	Port Madoc	3·52
,,	I. of W., St. Lawrence.	·70	,,	I. of Man, Douglas	2·33
,,	Alton, Ashdell.....	·22	XII.	Stoneykirk, Ardwell Ho.	2·41
III.	Winslow, Addington ...	·37	,,	Melrose, Abbey Gate...	1·36
,,	Oxford, Magdalen Col...	·18	XIII.	N. Esk Res. [Penicuick]	1·40
,,	Northampton	·34	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	·92	,,	Glasgow, Queen's Park.	1·47
,,	Wisbech, Bank House..	·58	XV.	Islay, Gruinart School..	2·13
IV.	Southend	...	XVI.	St. Andrews, Newton Bk.	·74
,,	Harlow, Sheering	·38	,,	Balquhidder, Stronvar..	2·86
,,	Rendlesham Hall	·40	,,	Dunkeld, Inver Braan..	·79
,,	Diss	·72	,,	Dalnaspidal H.R.S. ...	1·04
,,	Swaffham	1·10	XVII.	Keith H.R.S.	1·32
V.	Salisbury, Alderbury...	·16	,,	Forres H.R.S.	·74
,,	Warminster	·18	XVIII.	Strome Ferry H.R.S....	2·76
,,	Calne, Compton Bassett	·34	,,	Lochbroom	1·27
,,	Ashburton, Holne Vic..	·69	,,	Tain, Springfield.....	1·11
,,	Holsworthy, Clawton...	1·14	,,	Loch Shiel, Glenaladale	5·39
,,	Hatherleigh, Winsford.	1·56	,,	Invergarry	2 30
,,	Lynmouth, Glenthorne.	·50	XIX.	Lairg H.R.S.	1·21
,,	Probus, Lamellyn	·46	,,	Forsinard H.R.S.	1·54
,,	Wincanton, Stowell Rec.	·26	,,	Watten H.R.S.	1·30
,,	Wells, Westbury.....	·61	XX.	Dunmanway, Coolkelure	3·18
VI.	Bristol, Clifton	·97	,,	Fermoy, Gas Works ...	1·01
,,	Ross	·31	,,	Tralee, Castlemorris ...	1·57
,,	Wem, Sansaw Hall.....	·67	,,	Tipperary, Henry Street	1·50
,,	Cheadle, The Heath Ho.	·67	,,	Newcastle West	1·28
,,	Worcester, Diglis Lock	·19	,,	Miltown Malbay.....	4·26
,,	Coventry, Coundon	·03	,,	Corofin	...
VII.	Melton, Coston	·11	XXI.	Carlow, Browne's Hill..	1·40
,,	Ketton Hall [Stamford]	·17	,,	Navan, Balrath	·72
,,	Horncastle, Bucknall ...	·75	,,	Mullingar, Belvedere ...	2·11
,,	Mansfield, St. John's St	·54	,,	Athlone, Twyford	3·50
VIII.	Macclesfield, The Park.	1·79	XXII.	Galway, Queen's Col....	4·50
,,	Walton-on-the-Hill.....	1·99	,,	Clifden, Kylemore	6·32
,,	Lancaster, South Road.	2·07	,,	Crossmolina, Enniscoe..	3·81
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	1·69
IX.	Wakefield, Stanley Vic.	·93	XXIII.	Dowra	...
,,	Ripon, Mickley	1·06	,,	Rockcorry.....	...
,,	Scarborough.....	·86	,,	Warrenpoint	1·65
,,	East Layton [Darlington]	·60	,,	Newtownards	1·75
,,	Middleton, Mickleton..	·77	,,	Belfast, New Barnsley .	2·32
X.	Haltwhistle, Unthank..	1·69	,,	Cushendun	1·45
,,	Shap, Copy Hill	2·88	,,	Bushmills	1·87
XI.	Llanfrechfa Grange	·71	,,	Stewartstown	2·33
,,	Llandovery	1·86	,,	Buncrana	1·61
,,	Castle Malgwyn	1·03			

JULY, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·52	— 1·95	·25	11	6	90·4	26	47·6	9	0	0
II.		Maidstone (Hunton Court)...	·21	— 1·83	·13	12	3	...	...	...	...	..	...
,,		Strathfield Turgiss	·22	— 2·08	·10	11	5	90·1	26	42·3	9	0	0
III.		Hitchin	·10	— 2·60	·09	11	2	83·0	26	44 0	22*f*	0	...
,,		Banbury	·10	— 2·88	·09	18	2	85·0	26	46·0	1,9	0	...
IV.		Bury St. Edmunds (Culford)	1·26	— 1·71	·36	12	10	86·0	11*b*	40·0	22*f*	0	...
,,		Norwich (Cossey)	1·05	— 1·70	·44	13	9	83·0	25	40·0	1	0	0
V.		Weymouth (Langton Herring)	·25	...	·15	19	5	...	...	...	...	...	...
,,		Barnstaple.....	·94	— 2·61	·27	18	6	90·0	29	45·5	9	0	...
,,		Bodmin	·82	— 2·62	·30	7	11	81·0	26	43·0	14	0	0
VI.		Stroud (Upfield)	·35	— 2·49	·13	18	5	88·0	26*c*	43·0	16	0	...
,,		ChurchStretton (Woolstaston)	·63	— 2·40	·23	7, 19	4	81·0	25*d*	44·5	1, 14	0	0
,,		Tenbury (Orleton)	·33	— 2·58	·19	7	6	88·2	25	38·7	14	0	0
VII.		Leicester	·13	...	·11	19	3	90·8	25	...	...	0	...
,,		Boston	·52	— 2·01	·17	19	5	93·0	25	45·0	2	0	0
,,		Grimsby (Killingholme).....	·66	— 2·12	·27	19	8	81·0	25	47·0	2	0	...
,,		Hesley Hall [Tickhill].....	·36	...	·19	19	3	89·0	26	43·0	31	0	...
VIII.		Manchester (Ardwick).....	1·42	— 2·39	·64	19	8	81·0	26	46·0	14	0	0
IX.		Wetherby (Ribston Hall) ..	1·04	— 1·57	·82	20	4	...	...	...	...	...	...
,,		Skipton (Arncliffe)	1·43	— 3·52	·51	19	8	83·0	25	38·0	13	0	...
X.		North Shields	1·59	— ·96	·38	26	11	81·0	25	41·5	1	0	0
,,		Borrowdale (Seathwaite).....	11·90	+ 3·13	4·04	7	12	80·5	25	44·5	14	0	...
XI.	WALES.	Cardiff (Ely).....	·89	— 2·93	·36	18	5	...	...	...	...	...	...
,,		Haverfordwest	1·48	— 2·45	·97	7	6	80·0	27	37·0	13	0	1
,,		Plinlimmon (Cwmsymlog) ...	2·99	...	1·00	18	8	...	...	...	...	..	...
,,		Llandudno.....	1·57	— 1·14	·63	19	7	75·5	26	45·0	14	0	...
XII.		Cargen [Dumfries]	2·68	— ·45	·49	6*a*	13	80·8	24	38·6	1	0	...
,,		Jedburgh (Sunnyside).....	1·21	— 1·72	·39	18	8	82·0	24*e*	43·0	28	0	...
XIV.		Douglas Castle (Newmains)	1·27	— 2·02	·55	18	8	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory)	3·04	— 1·50	·65	11	14	...	...	...	..	...	...
,,		Oban (Craigvarren)	2·88	...	·66	6	17	75·5	30	44·0	20	0	...
,,		Mull (Quinish).....	3·87	...	·68	14	18	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·00	— 2·05	·40	8	5	...	...	...	...	...	...
,,		Arbroath	·79	— 1·85	·20	7	8	81·0	25	43·0	1	0	...
XVII.		Braemar	·84	— 2·02	·21	17	9	81·0	24	35·8	1	0	...
,,		Aberdeen	1·49	...	·54	3	14	83·0	25	43·0	20	0	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	·48	— 2·30	...	...	...	78·5	25	43·4	23	0	0
XIX.		Dunrobin	1·82	...	·65	16	11	72·8	2	40·0	8	0	...
,,		Orkney (Sandwick)	1·52	— 1·14	·29	17	16	67·9	25	...	...	0	1
XX.	IRELAND.	Cork (Blackrock)	1·32	— 1·52	·72	6	11	93·0	26	40·0	11	0	...
,,		Dromore Castle	2·12	...	1·00	6	5	77·0	30	45·0	24	0	...
,,		Waterford (Brook Lodge) ...	1·66	...	·72	6	9	79·5	27	39·0	18	0	3
,,		Killaloe	2·30	...	·67	19	14	80 0	25	48·0	12	0	...
XXI.		Portarlington	1·26	— 1·42	·39	19	11	83·0	26	43·0	1	0	...
,,		Dublin (Fitz William Square)	1·15	— 1·27	·54	19	10	77·0	25	44·7	1	0	0
XXII.		Ballinasloe	2·75	— ·13	·67	19	15	75·0	24*e*	41·0	14	0	...
XXIII		Waringstown	1·85	— 1·73	·40	10	12	85·0	25	40·0	11	0	0
,,		Londonderry (Creggan Res.).	2·24	...	·66	10	16	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·83	— 1·42	·62	10	17	78·0	24	37·0	13	0	..

a And 13, 17. *b* And 25, 26. *c* And 27. *d* And 26. *e* And 25. *f* And 23. *g* And 28.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather of the month was decidedly satisfactory for the wheat crop, for there was sufficient rainfall for this grain, though not enough for oats and barley. All root crops wanted rain badly at the close. Potatoes very small. Oats cut on 20th, wheat on 25th.

HITCHEN.—The driest month since the record was commenced in 1849.

BANBURY.—Mean temp. (63°·0) 1°·5 above the average. Rainfall the least ever recorded here; harvest (oats) commenced at the end of the month; high wind on 15th, 16th and 19th.

CULFORD.—Vegetation suffered much from want of R, that which fell from 11th to 13th not being sufficient to cause any improvement.

LANGTON HERRING.—With the exception of May, 1876, when ·18 in. of R fell, and November, 1879, when only ·08 in. fell, this was the driest month in the last 11 years. Mean temp. 0°·2 above the average of 13 years; the 26th and 27th were very hot; the max. of the 27th having been reached twice in the last 13 years, viz., on August 16th, 1876, and on July 15th, 1881, but never exceeded. The steadiness of pressure was remarkable. Hay carried in perfect weather; a good prospect for the wheat harvest.

BODMIN.—Mean temp. 60°·2. Magnificent weather during the whole month, and high, steady pressure.

STROUD.—A fine, hot, dry month; vegetation not much burnt up, but R wanted.

WOOLSTASTON.—A very dry and hot month; springs very low, and want of water much felt. Mean temp. 61° 0.

ORLETON.—A very dry and brilliant month, with warm days, and frequently cloudless but cold nights; very hot from 21st to 28th. Mean temp. about 0°·8 above the average of 24 years. Rainfall the smallest registered in July for 55 years. Pressure high and steady. No T heard or L seen during the month. Hay crop scarcely an average, but secured in fine condition.

LEICESTER.—A very dry month, no R having fallen between June 25th and July 18th; the heat for a few days was very great.

KILLINGHOLME.—A very dry month; there were some very hot days, but the weather at the close was cool and cloudy; pressure high and steady. No T or L.

MANCHESTER.—A fine month, although the temp. in the early part was low. Water is getting low at most waterworks in Lancashire, and some fears of a water famine are entertained.

SEATHWAITE.—Though R fell on only 12 days, the fall averaged nearly 1·00 in. per day. On the two days, 6th and 7th, 6·01 in. fell, and on the two days, 17th and 18th, 4·16 in.

WALES.

HAVERFORDWEST.—The month commenced, as June ended, cloudy and cool generally; nearly an inch of R, which was much needed, fell on 7th, and the temp. continued very low for the time of year till the 19th, when it began to increase, and from the 21st to the close reached 70° every day; after 27th the nights again became very chilly, and continued so to the end; the temp. of the 13th was remarkable, the min. on grass falling to 30°, the lowest recorded in 38 years. Mean temp. rather below the average. Wheat crops looking well, with fine long straw and fair grain; oats and barley also looking well; turnips suffering from the drought. Dense fogs and E. winds from 22nd to 24th produced blight and disease in potato crop.

LLANDUDNO.—A dry, bright month. Mean temp. nearly 1°·0 below the average; monthly range about the average and daily range 2°·0 below it. Rainfall 41 per cent. below the average.

SCOTLAND.

CARGEN.—The first half of the month was unusually cold for the season, but the last 12 days were unusually warm. Mean temp. (58°·1) 1°·5 below the average. Vegetation made rapid progress during the last 10 days; turnip and potato crops looking exceedingly well, and some of the earlier sown oats showing signs of ripening. Aphides of all kinds were unusually abundant on almost all plants, doing much injury to forest trees, fruit trees, &c.

JEDBURGH.—The weather was remarkably dry, the rainfall being 1·45 in. below the average of 20 years. Hay crop good and well secured; cereals good, but on light lands short in straw; root crops good, but on clay lands backward. T only heard twice, and at a great distance. Prevailing winds from 20th to the end, E., N.E. and N.

KILMORY.—I do not remember within recent years such continuous great heat, night and day, as prevailed from the 23rd to the close; during the great heat, pressure sometimes fell slightly during the day and rose at night. There were heavy dews.

OBAN.—The first half of the month showed an excess of rainfall, but the latter half has been unparallelled for sunlight, warmth, and drought for very many years, with the result that the hay crops on this coast are excellent, and the rye grass quite unusual for size and weight. This golden weather was ushered in with constant white cloud fogs lasting for whole days, and of great frequency.

QUINISH.—The first 18 days of the month were particularly cold, wet, and sunless, but on the 22nd heat suddenly set in and continued to the end.

BRAEMAR.—An unusually dry month, crops in consequence very much stinted.

ABERDEEN.—Exceptionally fine weather was the prevailing feature of the month. Rainfall 1·29 in. below the average. T on 3rd and 20th.

CULLODEN.—The almost entire absence of R during the month was remarkable; the weather was very sunny, and on some days the temp. was high, with continuous high pressure; barley colouring very generally at the close.

IRELAND.

DROMORE.—A very fine month; heavy dews at night, with light N. and E. winds prevailing, and sometimes heavy fog in the morning.

KILLALOE.—A month of splendid summer weather, especially in the last half, the max. temp. in shade ranging from 69°·0 to 80°·0; hay harvest made great progress; sheet L at night from 14th to 23rd; mean temp. 63°·6.

DUBLIN.—Very fine, and, for July, unusually dry; rainfall only 46 per cent. of the average; mean temp. only equal to the average, for the great heat of the last ten days was counterbalanced by a cold period from 12th to 20th. Mean temp., 59°·6, precisely the average; pressure above the average. There was no H, nor did electrical disturbances occur near Dublin. Mean humidity, 79; mean amount of cloud, 5·3; prevailing winds W., S.W., and W.N.W.

WARINGSTOWN. — The finest haymaking month remembered. Crops of forced grass enormous; when stooked for seed, as is the custom here, it is almost as tall as wheat. Intense heat prevailed for the last 10 days, the temp. rising to 80° almost every day. Potatoes in bogs were severely cut on the night of 11th though the thermometer on grass here, within half a mile, only registered 39°.

EDENFEL.—A month of almost uninterruptedly warm, and occasionally hot, summer weather; nearly all the R fell on five days, and was less in total amount than the fall in any other July during 21 years except 1868, 1872, and 1878. Hay crop abundant and excellent, and all other crops, except turnips, promise well. The growth of trees and the luxuriance of their foliage and flowering have been particularly remarkable this year. About 30 minutes after sunset on 29th an after-glow of unusual brilliancy occurred, throwing, for over ten minutes, a distinct shadow from trees and other objects.

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCXXXVI.] SEPTEMBER, 1885. [PRICE FOURPENCE, or 5s. per ann. post free.

METEOROLOGY AT THE INVENTIONS EXHIBITION.

IT is perfectly obvious—has been proved before—that annual exhibitions are a mistake. That millions of persons go to the Inventions Exhibition proves nothing, except the need for well-regulated places of amusement, with plenty of light, air, shelter, food, and music. That by the addition thereto of an infusion of Royalty, by low railway fares and by plenty of advertising, a big profit can be made, nobody need deny; but, presumably and professedly, higher objects are aimed at. In meteorology they certainly are not obtained. An Inventions Exhibition, with no exhibit from Casella, Negretti and Zambra, or Richard, is as fine a specimen of Hamlet with the Ghost left out, as could possibly be arranged. We said last year that "The day has not yet come when scientific instruments are considered worthy of as good a position as a wax model of a big turnip," and doubtless the poor place assigned to their exhibits last year has induced the firms we have named, and others, to stop away entirely. We think that they consulted their own dignity by so doing.

There is, however, quite sufficient to occupy a morning, and the majority of the instruments are, this year, placed in an excellent position, a marked contrast to their cemetery last year. We will take them according to their numbers in the catalogue, and mention also their locality, but the numbers are in some places very irregularly placed, and our readers must hunt them up for themselves. We shall only mention exhibits which contain somewhat unusual objects. The letters D, G, S, B under the numbers denote that the Diploma, Gold, Silver or Bronze Medal has been awarded for the articles mentioned.

EAST AVENUE.

1052. **Hollands, S. H.** *Aero-Dynamometer; a machine designed to gauge relative wind pressure, vertically and horizontally, on inclined aeroplanes, at various inclinations and velocities.* This model is among the aeronautical apparatus, but is worthy of examination by those interested in anemometers.

EAST ARCADE.

1364. B **Gray, J. W. & Son.**—*Lightning conductors.*—A thoroughly good exhibit; the best factory chimney protector that we have ever seen.

1378. B **Rogers, Francis M.**—*Electrical weather* (!) *vane* for showing within the house position of wind.*—Ordinary vane on short iron shaft, vane carries a contact maker; wire connects with indicator in any desired position. This instrument resembles Yeates's (2185), but gives only direction, not as theirs does, direction and velocity.

1398. **Brailsford, T. R.**—*Electrical rain gauge and register.*

SOUTH CENTRAL GALLERY.

2126. **Beck, R. & J.**—*New model barometers.*—The novelty is limited to the upholstery, *i.e.* they are ordinary pedestal barometers, but the wooden frames are carved columns, Corinthian, Ionic, &c., and there are aneroids with landscapes as a background.

2130. G **Lege A. & Co.**—*Self-registering barometer. Self-registering anemometers.*—These form parts of perhaps the best tide gauge we have yet seen; they are not designed to give absolutely perfect records of the meteorological elements, but to give all that can be required for the determination of tidal constants. The barometer is a syphon, mercurial with float, which by a watch chain raises or lowers a light frame carrying a pencil which usually is not in contact with the paper, but is driven against it once each hour by a tapper. The anemometer is a small size Beckley, recording on the same sheet, so that the level of water, direction and velocity of wind, and barometric pressure are all marked on one sheet driven by one clock.

2133. **Baker, C.**—*Aneroid barometer.*—About $4\frac{1}{2}$ in. in diameter, with lens, and stated to be capable of measuring an altitude of one foot.

2145. S **Denton, S. G.**—*Unalterable thermometers.*—Mr. Denton, not only again shows the thermometers for which he gained the medal at the Health Exhibition but he contributes two important statements.

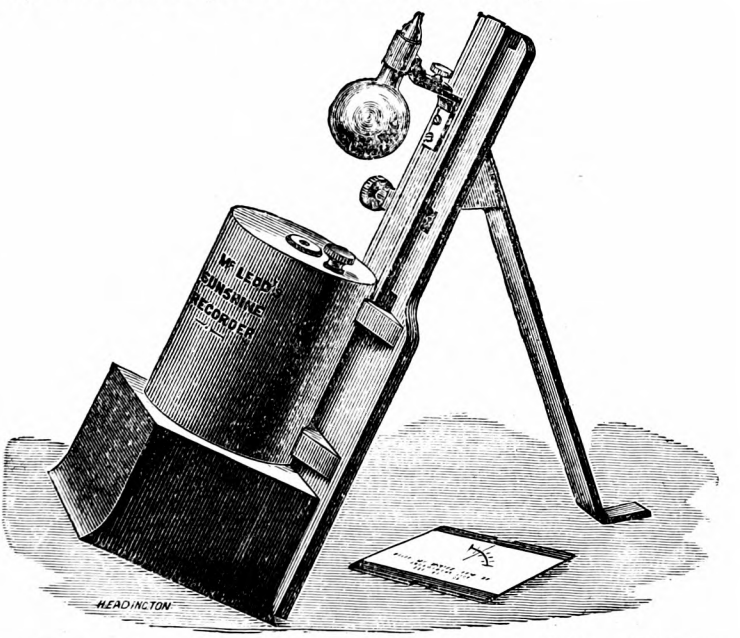
(1) He explains the process by which he has achieved this remarkable result—the most important in thermometry for a quarter of a century:—"I construct the thermometers with supplementary chambers, so that they will bear heating to over 150° F. above the highest point that they are intended to be used at. I then subject them to this extra temperature in heated oil for three weeks." (2) Mr. Denton announces that the rise in zero point with which we used to

* *Weather* cock has come down from remote ages, and must be submitted to; if vane requires another word it should evidently be *wind* vane.

be troubled is not due, as was always stated, to contraction of the tube, but to expansion of the mercury. And in support of this statement he mentions that (*a*) he blew 24 thermometer tubes, exhausted them, hermetically sealed them, and left them in hot oil for three weeks; (*b*) he filled them all with mercury, and divided them into two lots of 12 each; 12 were re-heated and have remained unaltered; 12 were not re-heated, and have risen about as much as is usual.

2160. **Hicks, J. J.**

G *New Sunshine Recorder*, invented by Professor McLeod, F.R.S. The annexed engraving gives an excellent idea of this instrument, and it is only necessary for us to explain very briefly the mode of action. The bottle-shaped object at the top is a spherical mirror; when the instrument has been properly placed, *i.e.* with its axis parallel with that of the earth and its face due south, the sun's rays falling on the spherical mirror will be reflected down on to the small lens in the top of the cylindrical box, and will pass on to the square box at the bottom. In this is placed a frame holding a sheet of ferro-prussiate paper on which the actinic rays fix a trace whenever the sun is shining.



Improved Anemoscope, by G. M. Whipple, B.Sc.—This has been engraved and described in the *Quar. Jour. R. Met. Soc.*, Vol. XI., p. 64. The object is to prevent the errors which sometimes arise from the foreshortening of the vane when nearly in the line of sight. This is effected by making the vane turn the ordinary letters N.E.S.W., and by fixing rigidly,

at right angles to the line of sight, a pointer; it is then only necessary to notice what letter or letters are nearest to the pointer in order to read off the direction.

Standard Thermometers, with fixed zeros that will not alter; heated by Hicks' Patent Process.—We are not responsible for this title, which is at any rate long enough. How a fixed zero *could* alter we do not know. At any rate we have here a second process closely resembling Denton's, and time alone will show whether it is equal, or inferior, to his. We do not see that it is possible for it to be better.

Solar Radiation Thermometers in vacuo, with very minute bulbs, the bore being magnified about twelve times.—This is a very useful application of what is known as "lens front" tubes. The size of the bulb of a thermometer regulates its sensitiveness, therefore the smaller the bulb the more sensitive, but a very small bulb necessitates a very fine bore, and then the thermometer is hard to read. By the above process the thread is magnified and made very legible, while the bulb is unusually small.

Patent enamel water gauges.—Mr. Hicks has patented the making of rain gauge and other measures in opal glass, except where the divisions are engraved, which is left transparent. We have not used one, and cannot express any opinion on the plan.

The catalogue says nothing of some *Six's Max. and Min. Thermometers*; from a meteorological stand point this is as well, but as specimens of glass blowing they are well worthy of attention.

2174. S **Latham, Baldwin, C.E.**—*Recording Rain Gauge.*—Three photographs of this gauge, for description of which see *British Rainfall*, 1878, p. 48.

2175. G **Stanley, W. F.**—*Radiation thermometer.*—Described in *Quar. Jour. R. Met. Soc.*, Vol. XI. p. 124. *Meteorologist's Rule.* See *Quar. Jour. R. Met. Soc.*, Vol. X., p. 303.

2178. S **Immisch, M.**—*Metallic thermometer for clinical and ordinary purposes.*

This is a very carefully made portable thermometer. It is, in fact, the smallest accurate thermometer which we have yet seen. Its motive power consists of a very fine Bourdon tube (*i.e.*, a microscopic edition of those used in Richard's thermographs), which causes the hand to traverse the silvered dial. The engraving is exactly the size of the complete instrument, and we may add that it weighs less than one-third of an ounce. If any one desires to make a pretty and useful present, here is an excellent chance.

2180. D **Kew Committee of the Royal Society.**—*Photo-nephograph or cloud height measuring apparatus.*—The apparatus itself is not shown, but a small model of it and several of the twin photographs which have been obtained. The apparatus consists of two small photographic cameras, the shutters of which can be opened or closed by electric current, and therefore simultaneously; the cameras are placed at a known distance apart and they are pointed approximately at any well marked feature of a cloud, and then simultaneous photographs are taken in each camera, and from these photographs the altitude and azimuth of the cloud can be accurately determined.

2183. **Adie, P.**—Mr. Adie says nothing about them in the Catalogue, but he shows some *barometers* which appear to sustain his high reputation for those instruments; we may mention as very successful an attempt at so mounting an accurate instrument as to render it suitable for ordinary hall use.

2185. S **Yeates & Son.**—*Electrical rain gauge.*—This was shown at the Scientific Loan Exhibition in 1876, and fully described, with a whole page engraving, in Vol. XI., p. 153, of this Magazine. *Electrical anemometer.* Robinson's cups and a windmill governor on an iron pillar, electric contact makers attached to each, and a compact registering apparatus for placing indoors.

2204. D **Physical Society of London** (Collective exhibit by the members).

Stanley, W. F.—*Barometrical and Thermometrical clocks for registering mean atmospheric pressure and temperature.* See *Quar. Jour. R. Met. Soc.*, Vol. III., p. 352.

Bailey, W.—*Integrating anemometer.* (See *Philosophical Magazine*, June, 1884, p. 483.)

Guthrie, Prof.—*Turbid thermometers.*—These are not at all intended for meteorological use, but as the idea is entirely new to us, and it is not at all certain that it may not be applied to meteorological purposes, we devote a few lines to it. Mixtures of triethylamine and water according to the proportions of each are perfectly transparent at low temperatures, but turbid at high ones. Prof. Guthrie has blown a set of nine small thermometer-like tubes and bulbs, has partly filled each with mixtures of the two liquids in varying proportion, and finds that they become turbid respectively at the following very different temperatures:—68°·3, 69°·4, 76°·1, 79°·9, 91°·4, 98°·6, 105°·2, 111°·2, and 123°·8.

Guthrie, Prof.—*Spiral cistern barometer.*—As this instrument, in its present form, stands no chance of ever being

employed in meteorology, it is needless to do more than record its presence, and say that, as its name implies, it is a syphon barometer with a horizontal spiral of tube between the long and the short column.

IN GARDEN WEST OF GREAT FOUNTAIN.

2207. **Curzon, H.**—*Manifest Rain and Dew Gauge, denotes* 1½ *in. of rainfall at a glance, in degrees of* $\frac{1}{100}$*th of an inch, first degree protracted and sub-divided for dew, &c. Compressible rubber tube within glass as safeguard against fracture by frost.*—A square 10 inch funnel (with too flat a rim) leading to a receiver perhaps 4 inches square by 18 inches deep; from the bottom of it a diagonal tube arises at an angle of about 20°, just as in Steinmetz's Vaporimeter*, the vertical depth of rain is therefore doubly increased, (*a*) by the funnel being perhaps six times the area of the receiver, and (*b*) by the diagonal tube, which perhaps multiplies it threefold, making the total scale perhaps 18 times the natural one; this is about twice as open as the jar of an ordinary 5 inch gauge, but we infinitely prefer our old friend, the Snowdon. One great, in fact fatal, objection to this gauge is its small capacity—it will hold only 1½ inches, and had it been in use in Norfolk and Suffolk last year, every record would have been spoiled unless the observers happened to have gone and emptied it during the rain. We have other objections to it, but do not think it needful to set them out.—*Curzon's Bascule Rain and Dew gauge, holds* 1½ *in. of rain, denotes* 80 *degrees* [*i.e.* 0·80 in.] *at a glance, remainder to be poured into a jug or returned for measurement, and two quantities added together. Compressible tube within glass tube.*—If anything, this is less fitted for practical work than the other.

IN GARDEN EAST OF GREAT FOUNTAIN.

2208. D **Royal Meteorological Society.**—*Typical Climatological Station.*—The above title is self-explanatory, and it is only necessary to add that the instruments were supplied by Messrs. Negretti & Zambra, and that a trained observer attends at each hour during the day to give any desired explanation. The instruments are too close together, but more space could not be obtained.

SOUTH CENTRAL GALLERY.

2251. **Green, C. & Fuidge, L. V.**—*Actinometer.*—This is for photographic not for meteorological purposes; but we are not sure that Total Illumination is not quite as important an element of climate as Total Bright Sunshine, and if so, this exhibit is suggestive.

* Steinmetz, A. "Sunshine and Showers," 1867, p. 142.

2235A. S **Jordan, J. B.**—*Sunshine recorders, Second pattern.*—These were not in the early editions of the Catalogue, and they have no number. A short description, with engraving of the first pattern, is given on p. 38 of this volume.

EAST CENTRAL GALLERIES.

2652. **Voss, R.**—*New improved patent hygroscopes.*—We feel rather inclined to contend that two out of these four words are incorrect, as is also the label on the stand which describes them as "Mithoff's metallic spiral" hygroscopes because they are mounted in metal cases. They *seem* to be made of a strip of parchment coiled round an axle which carries the hand on the dial, and they are in mountings much resembling 4-inch aneroids.

2739. G **Rung, Captain G.**—*Patent rain gauge.*—Fully described and engraved in *British Rainfall*, 1884, page 22. We are very glad, however, to find that the engraving in the *Meteorologische Zeitschrift* had misled us in more than one respect. The funnel at the Inventions Exhibition is quite a reasonable one, out of which neither hail nor snow would ordinarily get; we should, however, prefer the rim being a little stiffer. Captain Rung has been good enough to explain that the instruments of this type erected by the Danish Meteorological Institute are placed in small boxes in the open field, with the funnels 6 ft. 2 in. above the ground; we wish they had been 3 ft., the Government would then get for £17 what the English Meteorological Council paid more than twice that sum for, but neither the engraving in the *Zeitschrift*, nor the mounting at South Kensington, suggests such a possibility; if Captain Rung had sent a photograph of one *in situ* the mistake would have been impossible. Lastly, we learn that the suddenness of the fly back to zero is prevented by a perforated partition in the buckets; this also is not shown in the engraving. We congratulate Captain Rung on his instrument, but we certainly owe no thanks to his engraver.

Patent self-recording barometer.—This, though differing in nearly every respect, puts us in mind of Redier's barograph. We hope on a future occasion to give full details and engravings, but in the interim may state that it is a syphon mercurial barometer, attached to the short arm of a lever working on knife edges, the barometer being counterpoised by a weight running on rollers along the long arm of the lever. This weight is moved along the balance by a nut travelling on a screw actuated by a train of clockwork. When the movement of the mercury in the tube alters the position of the centre of gravity, a detent attached to the

end of the long arm starts the train of clockwork in one direction or the other until equilibrium is re-established. The nut carries an ink bottle and pen, which makes a trace on a sheet of paper kept in motion by a clock.

THE DROUGHT OF JULY, 1885.

As promised in our last number, we insert letters from nineteen of our correspondents on the drought of July, but owing to their large number, we have been reluctantly compelled to abridge some of them, and rigorously suppress everything not bearing directly upon the subject of the drought. We hope our correspondents will recognise the necessity for so doing, and accept our apologies for the unavoidable excision of a considerable amount of the very interesting matter with which they have favoured us.

Several of the July records mentioned in the following letters are less than a quarter of an inch, and one is less than a tenth of an inch; several also are almost as remarkable for their deficiency as compared with the average, and with the smallest amounts recorded in previous months. Up to the present time, Coventry (Coundon) heads the list of the smallest records with ·03 in., as printed in the Supplementary Table for July, and that Table shows one ... owing to correspondence with the observer at Hailsham, whose record for the month was so large (1·63 in.) that we thought some mistake had been made. In reply we received an interesting account of a TS which occurred on the afternoon of Sunday, 5th, yielding 1·32 in. of R, and we are sorry that want of space prevents its insertion.

To the Editor of the Meteorological Magazine.

SIR,—After 72 days drought with only ·47 in. of R at Benenden and ·56 in. here on 16 days with no fall exceeding ·07 in., we had TSS this afternoon, yielding ·19 in. I can find no other such dry period since I began to observe in 1863.—Yours truly,

Tenterden, August 20th, 1885. J. ELLIS MACE.

SIR,—We had only ·15 in. of R last month at Keston, but the springs after all are not yet so bad as last year at this time.—Yours truly,

Keston, August 20th, 1885. G. BUCHANAN.

SIR,—The rainfall (11·36 in.) of the first six months of 1885 exceeded that of the first half of any year since 1879, as well as the mean of the 17 years, 1868-1884; but during the following month the rainfall (·28 in.) was not only less than in any previous July, but less than in any one month during the preceding 17½ years through which my record extends. The total fall during the 56 days from June 10th to August 4th, both included, was only ·59 in. The bed of the river Ravensbourne has for several weeks been perfectly dry from above Bromley down to the springs below Shortlands and Southend (Lewisham), and continues so even after the

heavy R of the last few days. Among the peculiarities of the season may be noted the general scarcity of insects, especially butterflies, and the total absence of wasps and the usually destructive gooseberry grubs.—Yours faithfully, PERCY BICKNELL.

Foxgrove, Beckenham, August 8th, 1885.

SIR,—The rainfall here for July was ·77 in., being 1·07 in. below the average of the previous 18 years—but according to the 10 years 1870-79, it was ·92 in. below the average.—Yours truly,

Worthing, August 5th, 1885. W. J. HARRIS.

SIR,—The drought began on Wednesday, 24th of June, at 7 p.m., and has just terminated—August 6th, at 5 p.m.—a period of 43 days less 2 hours, during which time only ·25 in. of R fell.—Yours faithfully, H. GARRETT.

Highfield, Southampton, August 6th, 1885.

SIR,—The rainfall here for July was only ·12 in., which is nearly as small as any you quoted in the *Times*. On looking over my late father's rain record during the 34 years the record had been kept, I could find no single month during which so small an amount had been registered.—Yours faithfully, F. C. CLUTTERBUCK.

Long Wittenham, Abingdon, August 10th, 1885.

SIR,—The month of July has passed with a rainfall of only ·14 in. The average of the last 16 years, 1870-1885 inclusive, is 2·93 in. The nearest approach was July, 1878, ·52 in., and July, 1876, ·68 in. —Yours faithfully, R. LITTLEBOY.

Newport Pagnell, July 31st, 1885.

SIR,—I have read with much interest your letter in to-day's *Times*, with reports of the July rainfall from various stations. As my gauge registered even less than the minimum quoted in your letter, I venture to trouble you with the figures :—July 15th, ·01 in.; 18th, ·04 in. ; 19th, ·01 in. ; total for July, ·06 in. With these exceptions we had not a drop of R from June 25th to August 3rd ; since then, half an inch has fallen in 2 days.—Yours faithfully, T. E. COBB.

Cotefield, Bodicote, Banbury, August 5th, 1885.

SIR,—The drought has continued over 51 days, since June 10th, during which time only ·45 in. of R has fallen. During July I recorded only ·39 in., and ·18 in. of this fell on 12th.—Yours truly,

St. Cuthbert's, Southend, August 1st, 1885. C. J. HOLTHOUSE.

SIR,—The months of July and August this year having been very, not to say remarkably, dry here, I have thought it might be useful to place the fact on record as far as this place was concerned. I have, therefore, prepared the enclosed table showing the days and times at which I observed the difference of readings of the dry and wet bulb thermometers to be such as would give a relative humidity below 40, together with the general direction and force of the wind.

The 17th August was as dry as, or drier than, the 26th July (of which I sent you particulars), though the difference of dry and wet

bulbs was not so great, but then the temperature was 8° or 9° lower. —Yours very truly, R. H. BARNES.

Heatherlands, Parkstone, September 2nd, 1885.

1885.		Dry Bulb.	Wet Bulb.	Dew Point.	Relative Humidity.	1885.		Dry Bulb.	Wet Bulb.	Dew Point.	Relative Humidity.
Day.	Hour.					Day.	Hour.				
	p.m.						p.m.				
July 12	3.40	70·2	55·5	44·2	39	Aug. 17	1. 0	78·9	61·5	49·5	36
,, 26	1. 0	87·1	70·1	59·2	39	,, ,,	1.30	78·0	60·3	48·0	35
,, ,,	1.25	86·4	67·5	55·3	35	,, ,,	2. 0	79·3	61·7	49·6	36
,, ,,	2.15	88·0	69·5	57·7	36	,, ,,	2.30	79·6	62·2	50·3	36
,, ,,	3. 0	86·7	69·1	57·7	38	,, ,,	3. 0	79·4	62·5	50·9	37

July 12th..... Wind W. to N.
,, 26th..... ,, N.N.E. and S.S.W.
August 17th ... ,, N.W. to N.

SIR,—I have recorded here from January 1st to June 30th 16·09 in. of R, but only ·16 in. fell (on 3 days) in July, and although there have been local showers amounting here to 1·39 in. this month, all springs, ponds, streams, and reservoirs are lower than I have previously known them to be during my 20 years residence here.—Yours faithfully, R. H. LIPSCOMB.

E. Budleigh, Budleigh Salterton, August 26th, 1885.

SIR,—The rainfall here for last month was much less than at Okehampton or Holsworthy, as per your letter in yesterday's *Times*, viz., ·78 in. No R fell on the last 5 days of June, or on the first 4 days of this month (August), so that the ·78 in. for July is really the total fall for 40 days.—Yours truly, R. SANDERS.

Heale House, Littleham, Bideford, August 6th, 1885.

SIR,—Rain occurred here on only 6 days in July, measuring ·64 in., the greater part of which (·45 in.) fell on 18th. The average for the month for the past 17 years is 3·27 in., so that we have had 2·63 in. below the average for that period.—Yours truly, R. GORTON.

Cirencester, August 4th, 1885.

SIR,—From the 25th of June to the 4th of August, 39 days, the rainfall at Beckford was only ·13 in., viz., July 7th, ·03 in.; 18th, ·07 in.; 19th, ·02 in.; 21st, ·01 in.; total, ·13 in. Notwithstanding this long period with such a small amount of R. it has not been an absolute drought (14 days without R) according to your definition of that term in *British Rainfall*, 1884, but only a partial drought.—Yours truly,

Beckford, Tewkesbury, August 12th, 1885. F. SLADE.

SIR,—There were some rather remarkable results from the observations of my four stations last month (July). Downton gauge (my own) showed ·57 in., and the heaviest fall ·19 in., on 7 days. At Gwyrn-i-Aglwydd, just across the Radnor forest, there fell in the

month 1·41 in., with a heavest fall of ·81 in. on the 4th. This fall was only a slight shower of ·04 in. at Downton, and was not shown at all at Ednol, where 1·02 in. fell during the month, and where the heaviest fall was only ·28 in.; while at Pen-y-bont there fell only ·50 in. in the month, with ·14 in. as a heaviest fall. The Gwyrn-i-Aglwydd storm did not appear there at all. These stations are about 5 miles distant from each other on the different sides of the forest.—Yours very truly, E. PEARSON.

Downton, Kington, August 18th, 1885.

SIR,—I saw your letter as to the spring rainfall lately in the *Times*. Here we had in April, May, and June, 1884, 4·92 in. of R; in April, May, and June, 1885, 8·94 in.; in July, 1885, ·12 in. only. The result has been, in this immediate neighbourhood, the best crop of grass ever known and the best harvested.—Yours truly,

Waresley, Hartlebury, Kidderminster, Aug. 10th, 1885. J. WATSON.

SIR,—Between June 25th and August 3rd the rainfall here was only ·06 in. On August 6th, 1·91 in. fell, chiefly between 7 and 10 at night. We had almost constant T during that time, and although an inch of R in 24 hours generally causes a flood here, so dry was the land that the river has scarcely perceptibly risen.—Yours faithfully,

Rotherby Hall, Leicester, August 7th, 1885. J. HAMER.

SIR,—The rainfall during the month of July (·42 in.) has been remarkably small, being 2·20 in. less than the average for that month for 18 years. During that period there have only been three months with less rainfall, viz., January, 1880, ·18 in., June, 1868, ·27 in., and July, 1868, ·33 in. In the last mentioned year there was a very early and abundant corn harvest.—Yours faithfully, W. WESTON.

Eastwood, near Nottingham, August 4th, 1885.

SIR,—Our rainfall this year has been as follows:—From January to June 13·26 in., as against 10·68 in. the average for 27 years; July, ·57 in., as against an average of 2·33 in. You will thus see that we had a large excess in the first six months, and a large deficiency in July, but still insufficient to bring the total fall to the average. July was remarkable for its absence of TSS, but on August 6th we had warmer weather, followed by a TS during the night of 6-7th, during which ·55 in. of R fell, very nearly as much as the total fall of July.—Yours truly, HAROLD SMITH.

Hull, August 7th, 1885.

Leon Brault.

WE regret to record the death, at the early age of 47, of Captain Brault, Director of the Meteorological Branch of the Depôt des Cartes et Plans, Paris—an appointment analogous to that held in England by Captain Toynbee, and to that of our hydrographic office. Mr. Brault's excellent wind charts had already rendered great service to navigation, and he was engaged in their further improvement when he was taken from us.

LIGHTNING AND LUMINOUS CLOUDS ON AUGUST 6TH.

To the Editor of the Meteorological Magazine.

SIR,—Is it, or is it not, a common occurrence to see lightning rise from the ground to the cloud? On Thursday night last, between half-past nine and half-past ten, we had the grandest display of electricity that I have ever seen; distance, 14 to 31 seconds, or I suppose three to six miles. Twice my daughter and I saw distinctly streams of electricity rise from the ground to the cloud, and another, to me, curious phase was that *several* times a brilliant flash, occurring at the lower edge of a rising ground, extended upwards to the top, and then all along the edge to as far as trees, close to, allowed us to follow it in one continued line of vivid light.

The storm was in front, and on two sides of where we were, that is from nearly E. round by S. to S.W.

I certainly never saw any display of lightning so extensive or so vivid. One flash, I suppose nearer to me than the rest, so dazzled me that I could not read at all that evening.

F. GARTSIDE TIPPINGE.

Sansaw, Shrewsbury, August 9th, 1885.

[As regards "upstrokes" they are less often seen than downstrokes, but do occur from time to time. Some electricians say that every flash is double, and starts simultaneously from earth and cloud, but unless our eyes, and all the photographs of lightning flashes, are wrong, that theory is incorrect. Our impression is that upstrokes are rare, but that when they do occur they are very violent.

As regards the luminosity of a length of country, it is curious that Prof. Colladon, of Geneva, observed on the same night that "a long black cloud, stretching from the Dôle to the Galène, presented on each side a broad phosphorescent border, and about 9.15 p.m. there became suddenly visible in that part of the cloud nearest the Jura a luminous centre, whence escaped two or three phosphorescent rays pointing to the S.W."—ED.]

LIGHTNING STRUCK OAKS AT RICHMOND, SURREY.

During the thunderstorm of August 6th, two oaks near the White Lodge in Richmond Park were struck by lightning. The occurrence was described in a letter to the *Times*, inserted on September 5th, and as portions of that letter have been reprinted in *Nature*, *The English Mechanic*, and other papers, it is only necessary here to state that good photographs of the damage can be obtained from Mr. A. Seeley, The Ferns, Onslow Road, Richmond.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	·77	XI.	Rhayader, Nantgwillt..	3·03
,,	Margate, Birchington...	·56	,,	Carno, Tybrith	3·45
,,	Littlehampton	·30	,,	Corwen, Rhug	1·96
,,	Hailsham	·82	,,	Port Madoc	2·64
,,	I. of W., St. Lawrence.	·40	,,	I. of Man, Douglas	2·02
,,	Alton, Ashdell.....	1·22	XII.	Stoneykirk, Ardwell Ho.	2·07
III.	Winslow, Addington ...	2·50	,,	Melrose, Abbey Gate...	2·26
,,	Oxford, Magdalen Col...	1·66	XIII.	N. Esk Res. [Penicuick]	2·35
,,	Northampton	2·19	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	1·27	,,	Glasgow, Queen's Park.	2·52
,,	Wisbech, Bank House..	1·43	XV.	Islay, Gruinart School..	1·52
IV.	Southend	·40	XVI.	St. Andrews, Newton Bk.	2·39
,,	Harlow, Sheering	1·06	,,	Balquhidder, Stronvar..	5·51
,,	Rendlesham Hall	1·00	,,	Dunkeld, Inver Braan..	3·77
,,	Diss	1·25	,,	Dalnaspidal H.R.S. ...	4·43
,,	Swaffham	1·34	XVII.	Keith H.R.S.	3·42
V.	Salisbury, Alderbury...	·82	..	Forres H.R.S.	2·90
,,	Warminster	1·72	XVIII.	Strome Ferry H.R.S....	2·37
,,	Calne, Compton Bassett	2·18	,,	Lochbroom	1·48
,,	Ashburton, Holne Vic..	2·73	,,	Tain, Springfield.....	1·05
,,	Holsworthy, Clawton...	1·81	,,	Loch Shiel, Glenaladale	4·37
,,	Hatherleigh, Winsford.	1·28	,,	Invergarry	1 60
,,	Lynmouth, Glenthorne.	1·65	XIX.	Lairg H.R.S.	...
,,	Probus, Lamellyn	2·31	,,	Forsinard H.R.S.	1·50
,,	Wincanton, Stowell Rec.	2·37	,,	Watten H.R.S.	1·51
,,	Wells, Westbury.....	1·85	XX.	Dunmanway, Coolkelure	4·79
VI.	Bristol, Clifton	2·32	,,	Fermoy, Gas Works ...	3·42
,,	Ross	1·95	,,	Tralee, Castlemorris ...	2·27
,,	Wem, Sansaw Hall.....	2·01	,,	Tipperary, Henry Street	3·93
,,	Cheadle, The Heath Ho.	1·97	,,	Newcastle West	3·08
,,	Worcester, Diglis Lock	2·53	,,	Miltown Malbay.....	2·14
,,	Coventry, Coundon	2·82	,,	Corofin	...
VII.	Melton, Coston	...	XXI.	Carlow, Browne's Hill..	2·29
,,	Ketton Hall [Stamford]	3·71	,,	Navan, Balrath	2·60
,,	Horncastle, Bucknall ...	2·46	,,	Mullingar, Belvedere ...	3·71
,,	Mansfield, St. John's St	2·41	,,	Athlone, Twyford	3·13
VIII.	Macclesfield, The Park.	...	XXII.	Galway, Queen's Col....	2·98
,,	Walton-on-the-Hill.....	2·10	,,	Clifden, Kylemore	4·48
,,	Lancaster, South Road.	3·08	,,	Crossmolina, Enniscoe..	3·04
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	1·80
IX.	Wakefield, Stanley Vic.	1·09	XXIII.	Dowra	...
,,	Ripon, Mickley	2·39	,,	Rockcorry.....	...
,,	Scarborough.....	2·27	,,	Warrenpoint	2·74
,,	East Layton [Darlington]	1·69	,,	Newtownards	2·66
,,	Middleton, Mickleton ..	1·42	,,	Belfast, New Barnsley .	2·67
X.	Haltwhistle, Unthank..	2·98	,,	Cushendun	2·94
,,	Shap, Copy Hill	3·21	,,	Bushmills	1·32
XI.	Llanfrechfa Grange	2·43	,,	Stewartstown	2·13
,,	Llandovery	2·61	,,	Buncrana	2·18
,,	Castle Malgwyn	2·39			

AUGUST, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·85	— 1·89	·25	26	12	79·3	17	43·3	14	0	0
II.		Maidstone (Hunton Court)...	·73	— 1·51	·18	26	11	...	...	...	...	...	...
,,		Strathfield Turgiss	·90	— 1·52	·32	8	6	79·4	17	43·8	23	0	0
III.		Hitchin	2·39	+ ·11	·40	12	11	70·0	17	39·0	13*a*	0	...
,,		Banbury	2·75	+ ·05	·60	27	14	74·0	16	37·0	14	0	...
IV.		Bury St. Edmunds (Culford)	2·29	+ ·12	1·31	5	7	75·0	10*b*	35·0	13	0	...
,,		Norwich (Cossey)	·64	— 1·98	·16	20	8	75·0	10*c*	37·0	15	0	1
V.		Weymouth(LangtonHerring)	1·04	...	·40	26	11	...	...	...	...	...	...
,,		Barnstaple	1·05	— 3·05	·36	6	10	79·0	27	45·0	4	0	...
,,		Bodmin	2·64	— 2·20	·72	6	12	74·0	19*d*	45·0	15	0	0
VI.		Stroud (Upfield)	2·50	— ·67	·55	26	13	75·0	10*e*	42·0	13*f*	0	...
,,		ChurchStretton(Woolstaston)	3·52	— ·56	1·81	4	13	72·0	16*g*	44·0	14*h*	0	0
,,		Tenbury (Orleton)	2·87	— ·85	1·18	4	11	78·5	17	33·3	14	0	1
VII.		Leicester	2·98	...	·82	6	15	76·0	25	40·5	15	0	3
,,		Boston	1·26	— 1·35	·44	7	9	82·0	25	42·0	14*c*	0	...
,,		Grimsby (Killingholme).....	2·29	— ·63	·71	20	10	71·5	10	41·0	14	0	...
,,		Hesley Hall [Tickhill].....	1·39	...	·33	6	8	76·0	16	36·0	15	0	0
VIII.		Manchester (Ardwick).....	1·66	— 2·26	·54	12	13	70·0	1*i*	43·0	14*j*	0	...
IX.		Wetherby (Ribston Hall) ...	1·30	— 1·33	·51	7	6	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·39	— 2·41	·95	12	12	72·0	16	35·0	13	0	...
X.		North Shields	3·55	+ ·46	1·91	5	12	71·5	10	38·5	14*f*	0	0
,,		Borrowdale (Seathwaite).....	8·36	— 2·68	3·25	10	10	73·8	1	35·2	30	0	...
XI.	WALES.	Cardiff (Ely).....	2·79	— 2·54	·72	6	12	...	...	...	...	...	...
,,		Haverfordwest	3·00	— 1·97	·92	9	12	72·2	2	38·5	4	0	0
,,		Plinlimmon (Cwmsymlog) ...	2·71	...	·56	9	10	...	...	...	...	...	...
,,		Llandudno.....	·91	— 2·28	·18	5	10	69·0	9	44·0	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·49	— ·78	·74	9	10	74·2	1	35·0	30	0	...
,,		Jedburgh (Sunnyside).....	1·47	— 1·90	·46	12	9	70·0	1	35·0	30	0	0
XIV.		Douglas Castle (Newmains)	5·59	+ 1·29	1·80	3	10	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	3·79	— 1·43	1·17	12	10	...	...	...	...	...	...
,,		Oban (Craigvarren)	2·10	...	·66	10	10	70·5	19	42·6	27	0	...
,,		Mull (Quinish).....	1·92	...	·43	9	9	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·10	— ·98	1·10	8	8	...	...	...	...	...	...
,,		Arbroath	1·52	— 1·81	·40	9	9	71·0	21	39·0	14	0	...
XVII.		Braemar	4·96	+ ·53	3·44	12	12	73·0	1	29·1	31	1	5
,,		Aberdeen	2·02	...	·92	12	16	70·0	16	33·0	30*k*	0	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	1·89	— 1·11	...	...	...	69·0	1	33·0	31	0	5
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		Orkney (Sandwick).....	1·68	— 1·22	·58	10	16	62·5	9	...	...	...	...
XX.	IRELAND.	Cork (Blackrock).....	4·46	+ ·63	1·37	27	13	88·0	17	40·0	20	0	...
,,		Dromore Castle	2·98	...	1·00	8	10	77·0	20	45·0	23	0	...
,,		Waterford (Brook Lodge) ...	4·63	...	·77	27	13	75·0	18	40·5	20	0	1
,,		Killaloe	3·46	...	·93	27	13	77·0	1, 2	40·0	14	0	...
XXI.		Portarlington	2·63	— ·44	·51	6	15	78·0	1	39·0	14	0	...
,,		Dublin (FitzWilliam Square)	3·05	— ·13	1·72	4	14	71·4	17	41·2	14	0	0
XXII.		Ballinasloe	2·38	— 1·65	·72	30	11	72·0	1	33·0	14	0	...
XXIII		Waringstown	1·44	— 2·00	·51	5	12	82·0	1	40·0	13	0	0
,,		Londonderry (Creggan Res.).	2·18	...	·64	12	13	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·44	— 2·21	·27	5	13	75·0	1	40·0	13	0	...

a And 14. *b* And 16, 17, 25. *c* And 15. *d* And 20. *e* And 16, 25. *f* And 30. *g* And 25.
h And 15, 30. *i* And 10, 16, 24. *j* And 15, 19. *k* And 31.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Altogether a very fine and dry month, though the nights were cold, prolonging the later harvest. Hops in this county an almost total failure; autumn growth of grass checked by the cool temperature; keep scarce; root crops unfavourable; potatoes not so good as last year; hay crop very good; no T or L all the month.

HITCHEN.—The coldest August on record.

BANBURY.—A rather favourable month for harvest work, but R too late to be of much use to grain; crops hardly so good as was expected. Mean temp., 55°·9; TSS on 6th; H on 7th; high wind on 12th and 28th.

COSSEY.—A cold, dry month, the temp. rose to 70° on only five days; wheat harvest commenced on 10th, and all corn was secured by 31st.

LANGTON HERRING.—Another very dry month, rainfall 1·69 in. below the average of ten years; from June 25th to August 25th inclusive (62 days) the rainfall was only ·54 in., the average for the corresponding 62 days of ten years being 5·16 in. Mean temp. more than 2° below the average of 13 years, and the lowest for August in that period. Distant T on 6th, 7th, and 23rd, but no TS here this summer; heavy dew on 25th; high wind on 26th.

BODMIN.—Magnificent weather during the whole month. Mean temp., 59°·8.

STROUD.—Unsettled weather till 12th, and cold towards the end of the month. L on 6th, TS on 7th, high wind from S.W. from 8th to 12th.

WOOLSTASTON.—A favourable month for the harvest; mean temp., 55°·8. The rainfall of the 4th was the heaviest recorded here during 20 years. T and L on 6th.

ORLETON.—With the exception of a few days about the 16th, the temp. was uniformly low with a prevalence of cold, clear nights and fine days. Mean temp. nearly 4°·5 below the average of 24 years, and more than 2° lower than that of 1862, the lowest in that period; pressure generally high and steady; prevailing winds N. and E.; prolonged TS and ·58 in. of R on 6th; frost on grass on 14th.

LEICESTER.—Cold for the time of year; TS on 5th; TS with H on 6th.

KILLINGHOLME.—The month was cold, owing to the prevalence of polar winds; moderate rains saved the root crops and did not injure the corn; harvest made rapid progress, but wheat did not yield according to promise. T and L on 6th and 7th; distant T on 12th.

MANCHESTER.—The month although fine on the whole was remarkably cold; a few miles from Manchester there were frosts on two separate occasions during the month, and even at Ardwick, which is well within the influence of the city, the temp. was on three occasions as low as 43°; only one slight TS.

SEATHWAITE.—Stormy on 9th and 10th, with 5·42 in. of R in the two days.

WALES.

HAVERFORDWEST.—The weather continued fine and warm until the 6th, on which day the air was cold early (wind S.E.), and large masses of rocky cumulus were aggregating. About noon the appearance was very threatening, a bank of cloud of intense blackness extending from E N.E. to N.W.; this developed into a circular storm of great intensity, with very vivid forked L of a remarkably fine rose colour. In this immediate neighbourhood the storm culminated about 7 p.m., when a terrific flash of rose-coloured L occurred, followed by a deafening peal of T, and ·50 in. of R in half an hour. Broken weather prevailed from 11th to 13th, from which date to the end of the month it was warm and fine. A grand harvest month, splendid corn crops, green crops also very good. Mean temp. below average, 70° being reached on only six days.

LLANDUDNO.—A dry and bright month, but owing probably to the prevalence of polar winds, particularly towards the end of the month, the mean temp. was no less than 3°·8 below the average; the monthly range 6°·1, and the daily range 2°·9, were also below the average; 173 hours of bright sunshine were recorded.

SCOTLAND.

CARGEN.—Mean temp. 3°·6 below the average; the coldest summer observed here for 25 years, the mean temp. of the months May, June, July, and August being 3°·1 below the average. Most of the corn was cut in this district by the end of the month; T and L on 6th and 7th; gale on 10th.

JEDBURGH.—The month was marked by cold E. and N.E. winds, and a total absence of R during the latter half. Potato crop so far remarkably good and free from all disease; cutting of grain crops quite general during the latter half of the month; barley above the average, oats an average crop; springs and rivers remarkably low; great absence of sunshine.

KILMORY.—The weather was remarkable for the alternation in character of both temperature and wind. The heat of the sun on the afternoon of 21st was extraordinary, indeed during the latter half of the month the amount of sunshine was such as is very unusual in this locality. Barley and some oats cut, and harvest will be general at the beginning of September. Heavy R (·97 in.), and strong S.S.E. wind on 10th.

QUINISH. — Frost on night of 27th, blackening potatoes and French beans.

BRAEMAR.—A dry but very cold month, with prevalent E. wind. On the night of the 12th the mountains were covered almost to their base with S, this not having been seen before in August by the oldest inhabitant; 3·44 in. of R fell here on that day, the heaviest fall recorded during 29 years' observations.

ABERDEEN.—Fine month; rainfall below the average.

CULLODEN.—Very dry, with temp. below the average; the grass temp. falling on the night of the 31st to 25°·2; the potato crop considerably damaged.

IRELAND.

BLACKROCK.—1st and 2nd fine, then showery to 12th, followed by very fine and often hot weather to 25th, then showery to the end. It is notable that twice in the month more than an inch of R fell in 24 hours, which very seldom occurs here in any one month, viz., 1·36 on 8th, and 1·37 on 27th.

DROMORE.—The month was everything that could be desired.

WATERFORD.—Rainfall ·88 in. above the average of 25 years; T on 4th and 5th; S.W. gale on 9th and 10th; fog on 16th, 25th and 26th.

KILLALOE.—With some heavy showers in the first and closing weeks of the month, a period of fully a fortnight of brilliant weather enabled hay harvesting to be finished in fine condition.

DUBLIN.—A very cool, changeable month, and an unusual preponderance of winds from "polar" quarters. More than half the rainfall (56 per cent.) was measured on 4th, and the rainy days were only 14, compared with an average of 15·5. There was H on 4th and 12th, and electrical disturbances occurred near Dublin on 4th and 7th. The atmosphere was foggy on 24th, 25th and 26th, and frequently hazy during the latter part of the month. Mean temp. 55°·9, 3°·0 below the average of 20 years, and lower than that of any August in that period, the nearest approach being in 1881, when the mean temp. was 56°·0. Mean humidity, 83; prevailing winds, E.N.E. and N.

WARINGSTOWN.—The R of the first and second weeks, though it did much. good, was insufficient to affect pastures to any great extent, and during the last fortnight the grass was much burned up, and a water famine was imminent.

EDENFEL.—Another "old-fashioned" summer month, calm, generally clear and occasionally hot, with a rainfall considerably less than half the average. The somewhat remarkable sequel of a late harvest has followed this charming summer, and even now (September 4th) five-sixths of the cereals are unreaped, and the potato haulm is quite as green as ordinarily in July, and the tubers more free from disease than in any year since 1845.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXVII.] OCTOBER, 1885. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE RAINBAND VINDICATED.

IT is now some four years since that in the pages of the *Meteorological Magazine* I essayed to give a popular character to a comparatively unknown branch of science in my "Plea for the Rainband."

Has this plea been successful, and has the rainband vindicated its position as a weather prognostic? I venture to think that both these questions may be answered in the affirmative. Soon after the publication of the article, I was requested by a well-known optician to permit a reprint of it as a companion to the spectroscope, and before long many copies of it were distributed amongst meteorologists and others. This brought the matter before the public, and not long after rainband spectroscopes, pamphlets, and discussions showed that a keen interest was felt in the subject.

Of course, as in the case of all other new objects, the first rush for information and possession by and by passed, and the interest in it to a certain extent subsided. I have recently found, however, from enquiries and correspondence addressed to me, that this, though diminished, has by no means died out. I propose, therefore, to justify what the "Plea" advanced by shortly stating the subsequent progress of rainband spectroscopy to the present time.

The impetus given to the enquiry may be recognized in three ways: by (1) its recent literature; (2) the increased use of the spectroscope as a meteorological adjunct; and (3) recorded observations and their results.

THE RECENT LITERATURE.

In taking up the first subject, the recent literature of the rainband, I propose to deviate somewhat for the purpose of introducing an interesting early notice of it which escaped my attention when writing my "Plea," and which it would be unjust now to omit. It dates back as far as 1869, and will be found in the *Meteorological Magazine* for July and October of that year, vol. iv. Nos. xlii. and xlv., "The indications of the sky." The first part of this article describes and figures Saussure's cyanometer and its mode of use, and then after quoting Kaemtz on the blue colour of the air comes the

following passage :—"In spite of ourselves the above extract has led from the original subject of this article, the cyanometer, to what must, we presume, be held to be its legitimate successor, the spectroscope." The second part of the article treats of the spectroscope and its advantages to meteorologists, and by an extract from the British Association Report for 1868, "Observations on the atmospheric lines of the solar spectrum in high latitudes, by George Gladstone, F.C.S., F.R.G.S.," it points out the distinction between "atmospheric" and "solar" lines, and shows how these former are always most prominent with a low sun, while scarcely visible with a high one. Also that the red end of the spectrum varies under similar circumstances in length and brilliancy. Prof. Roscoe's "Spectrum Analysis" is quoted, a figure of a pocket spectroscope (reproduced here) is given,

Fig. 1.

and the article ends thus :—"No one can tell what secrets lie hid in these atmospheric lines, but to us it seems that by their careful and systematic observation the 'Message from the Stars' which has taught us so much may be rivalled in practical importance by a 'Message from the Sky.'"

This prediction may not have caught the full import and meaning of the atmospheric bands and lines, but at least it forecasts the value they subsequently attained in meteorology.

Passing from this, we will refer to a correspondence in the *Times*, which took place in the latter part of 1882, and in which both sides of the question were jealously advocated. Prof. C. Piazzi Smyth here pens a series of letters in favour of the rainband. In one of these he states he saw a spectroscopic rainband, "the blackest and most intense of the season," and "destructive floods followed." As the rainband cleared away, "magnificent harvest days followed." Mr. Ralph Abercrombie sees no value in the rainband, and pins his faith upon "isobaric lines," and the forecasts of the Meteorological Office derived therefrom. The Duke of Argyle in a yachting cruise could not see that the rainband had any predictive value, and thinks Prof. Smyth's case was a "good shot." Per contra, Mr. Cory, F.M.S., contends for the value of the rainband, and gives reports of a series of observations proving his case. Agricultor (in the *English Mechanic*) " has been much struck by the accuracy with which the rainband appearance predicts coming rain."

Mr. Abercrombie's isobars are most amusingly discounted by Sir Edmund Beckett in a letter containing a long list of official weather

prophecies and their want of fulfilment, and recommending "a return to Zadkiel." In June, 1883, my weekly weather report to the *Surrey Advertiser* contained the following:—"Of these rainfalls, the only indication was the rainband, the barometer throughout standing fairly high (between 29·84 in. and 29·99 in.)" Thus the public prints not only took an interest in, but on the whole supported the rainband theory.

As observers and observations increased, more solid literature was developed, including:—*Nature*, vol. xxvi., pp. 552-4, "Spectroscopic Weather Discussions," by Prof. C. Piazzi Smyth, in which the whole subject is reviewed in a condensed form with instructions to observers, and illustrated by two diagrams of the D part of the solar spectrum under considerable dispersion, the one taken in August, 1882, under moist air conditions, and the other on September 4th, 1882, after a whole week of very dry weather. In this article it is shown that, apart from the spectroscope, the wet bulb difference only slightly indicated the sweeping away which took place in September of the water vapour details shown in the August spectrum. On another occasion Prof. Smyth defended the rainband, *Nature*, vol. xxix., p. 525, "Rainband spectroscopy attacked again." In an essay read before the Phil. Society of Washington, and printed in the *American Journal of Science*, the writer of it referred to the "unsatisfactory evidence" of the rainband, because "if the spectroscope is first turned to the sky in any direction, and afterwards to a white wall fifty feet distant, it will be found impossible to distinguish between the appearance of the rainband, as shown by the whole atmosphere, and by the layer fifty feet thick."

The Professor disposes of the objection by promptly pointing out that "the white wall reflects the light and sky spectrum solar lines, and telluric lines and all!"

Of the books and articles published, the following were kindly sent me by the authors:—

"The Science Monthly," illustrated, for December, 1883. "The Hygro-Spectroscope (or Rainband Spectroscope)," by F. W. Cory, F.R.Met.S., with illustrations of a spectroscope and a rainband spectrum.

"How to foretell the weather with the pocket spectroscope," F. W. Cory (Chatto and Windus, 1884); 86 pages, and 10 illustrations of instruments, charts, &c. The Appendix contains the September, 1882, *Times* correspondence in full.

"Observations of the Rainband from June, 1882, to January, 1883," by Hugh Robert Mill, B.Sc., communicated by Prof. Tait to the Proceedings of the Royal Society of Edinburgh, with a chart.

"The Rainband: How to observe it, and what to expect from it," by Hugh Robert Mill. Hilger, 1883. With four figures and a chart.

In the above papers and volumes are contained much useful instruction in the use of the spectroscope, and valuable tables and statistics of rainband results, some of which are referred to later on.

THE INCREASED USE OF THE SPECTROSCOPE.

The increased use of the spectroscope quickly followed the publication of the "Plea."

Mr. Browning, at my suggestion, prepared a "standard" instrument, in which was represented a spectrum, as nearly like as possible that figured in the frontispiece to the "Plea."

In this instrument was introduced what I considered for the special purpose an improvement, viz., a fixed slit. This showed the lines about as wide as in the plate, and in a series of observations secured their correspondence.

THE STANDARD SPECTROSCOPE.

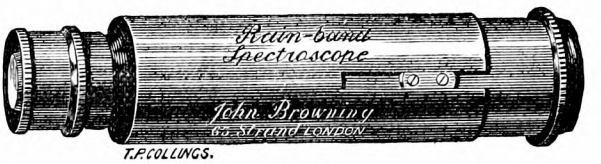


Fig. 2.

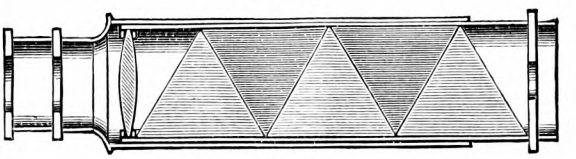


Fig. 3.

Of course many other opticians soon began to supply "rainband spectroscopes," but these varied considerably in power and dispersion, and thus did not realize what was my idea of uniformity of observation. I do not wish to specially recommend any maker, but I think it really would be of great advantage if the Royal Meteorological Society or some other competent tribunal would define the width of slit, dispersion of prisms, and the magnifying power to be used. Every observer who has tried several spectroscopes knows how the appearance of the rainband varies according to these incidents.

(To be continued).

Robert Beckley.

In Robert Beckley has passed away one of the best, if not actually the best, mechanic ever occupied with the construction of the heavier class of meteorological instruments.

As mechanical assistant at Kew Observatory, he was at once in the position most accordant with his own wishes, and most useful to science.

It would be tedious to enumerate all the improvements which he suggested—those who knew him best, know best his rare skill, but to meteorologists of all countries the excellence of the Beckley pattern of the Robinson anemometer will be a sufficient indicator of his skill.

THE LUMINOUS CIRRUS CLOUD OF JUNE AND JULY.

To the Editor of the Meteorological Magazine.

SIR,—Seeing the mention on p. 96, of the singular and very brilliant cirrus clouds visible on several occasions during June at Dublin, I write to say that I witnessed a similar phenomenon at Kissingen (Bavaria), on June 8th and 10th, and July 7th. A letter in *Nature*, of July 16th, describes their appearance, as seen at Southampton on the 6th of that month; and they were observed on the same evening from Blackheath.

It was evident to me (at Kissingen) that the sun was shining on them, and they were so thin as to become quite invisible when the sun ceased to illuminate them; but I did not see these clouds at all before sunset, and cannot say whether they existed then.

The colouring of the upper part was pale steel blue, gradually changing through a dull green to yellow and orange below, varying a little on the three evenings, and at different times. The phenomenon was extremely striking at so late an hour, the mode in which the clouds reflected the light reminding me of the unusual iridescent clouds so widely remarked on a few days last December; but both the colours and the kind of cloud were different.

As the dates of the displays at Dublin are not given, I am unable to decide whether I was viewing the same sheet of cloud at Kissingen; but the one day difference of date of my observation in July, from that in England, would probably be no more than the time required for it to traverse the intervening distance.—Yours truly,

T. W. BACKHOUSE.

Sunderland, 10th Sept., 1885.

SEPTEMBER FROSTS.

To the Editor of the Meteorological Magazine.

SIR,—The following minimum and mean temperatures recorded here on a Glaisher stand are very remarkable:—

	Min.	Mean.
26th September, 1885	31°·7 ...	42°·8
27th ,, ,, ...	28 ·8 ...	38 ·9

My only September readings during the last 17 years at all comparable with these are:—

	Min.	Mean.
22nd September, 1872	32°·0 ...	44°·5
23rd ,, ,, ...	30 ·5 ...	46 ·0
15th ,, 1882	30 ·6 ...	47 ·3

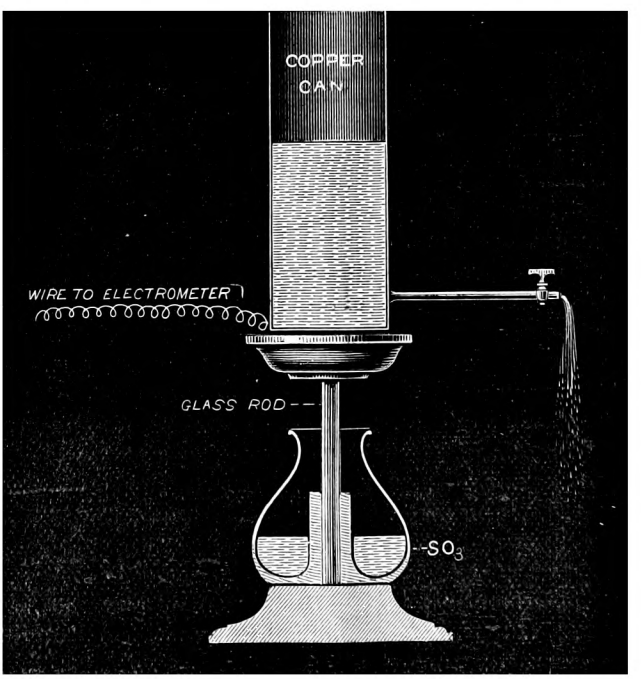
but the mean (38°·9) of the 27th inst. is not only considerably lower than these, but 1°·8 below that (40°·7) of 28th September, 1824, given in Mr. Glaisher's tables as the lowest September temperature in the past 60 years.—Yours faithfully, PERCY BICKNELL.

Foxgrove, Beckenham, Sept. 30th, 1885.

ATMOSPHERIC ELECTRICITY.

To the Editor of the Meteorological Magazine.

SIR,—In continuation of my former letter, and before stating the "results," I wish to describe another way of collecting electricity from the air which has been adopted. This consists of a copper can about six inches across and eighteen inches high, and containing some two gallons of water. This is furnished with a long tube or spout, ending in a brass tap with a small aperture. It is placed on a Mascart insulating stand, and connected with the electrometers by a copper wire. As soon as the tap is turned on, and the water issues from it, the can at once becomes charged with electricity of the same sign as the surrounding air. The effect is greatest when the stream is broken into drops in its fall. This apparatus was found to give, at 15 ft. above ground, deflections of 5° and 10° with the quadrant electrometer, when both sets of points gave no signs of charge whatever. At another time, and when only 4 ft. from the ground, it afforded results, the air being so damp that it was difficult to excite the electrophorus, with which the quadrants were at that time charged. It is thus very sensitive, and at the same time portable.



The general observations have been hardly numerous enough to warrant the assertion of fixed laws, but they seem to establish the following facts pretty satisfactorily :—

(1) The wind is evidently a strong excitant of electricity. One bright morning, as gusts of wind swept across an outside insulated brass plate, each gust was accurately repeated by a beat of the gold leaf suspended in the Bohnenberger electrometer.

(2) As a rule, though not without exception, the mornings marked "blue sky" showed feeble positive electricity. The exceptions seemed to have occurred lately, when much morning mist has prevailed, and the hygrometer has stood high.

(3) Clouded and damp mornings, though also with exceptions, have yielded the negative sign.

(4) Storms (with one exception) have always given a strong negative sign as they approached the "points." As snow or rain fell, this changed to positive, and in several instances there was a change back to negative before the indications ceased. The exception was a storm on the 24th of July, 1884, at 8.30 p.m., after a fine day, when the sign was first positive, then negative, and ultimately positive again. On rain or snow falling, the electrical conditions in these cases, became very marked, sparks flying from the ends of the conducting wires, the pith balls diverging widely, the mirror deflections amounting to 80°, and the gold leaf being torn away or broken up.

(5). Probably strata opposite in sign may co-exist at different elevations above the earth's surface. Thus on December 6th, 1883, at 10 a.m., a snow-storm coming on, the tower points were strongly negative, but the points near the observatory were charged positively, and this persisted for a quarter of an hour.

(6). The observations do not show with any certainty whether the quantity of electricity varies with the height of the points above the observatory. Five instances are, however, marked "from the tower only," and two "from the lower points only." The tower current has at times been the stronger. Generally it is the weakest, but this I attribute to the resistance of 300 feet of wire, which complete its connection with the receiving apparatus.

From what I have described, it will be seen that periodic observations of atmospheric electricity are possible with simple and inexpensive apparatus. Where expense is not an object, it would be easy to convert these into self-recording forms (as at Greenwich), and thus obtain a continuous and more valuable series of observations.

J. RAND CAPRON.

Guildown Observatory, August 9th, 1885.

ON THE CLIMATE OF THE BRITISH EMPIRE DURING 1884.

The Annual Climatological Table which we have now published in exactly the same form for some years, scarcely needs any introduction. The number of stations shows a slight increase over the number available for 1883, but Barbados, which is usually prominent, owing to its peculiarities of climate, is absent, the return for one month having failed to reach us. Malta appears for the first time.

The unenviable extremes noted in the following summary are distributed over somewhat different stations than those appearing last year, though Adelaide heads the list for extreme heat. Winnipeg has resumed its old place for the other extreme of cold, and Colombo takes the place of Barbados for uniformity of temperature while still appearing with the greatest total rainfall. The two extremes for which Malta appears — least amount of cloud and smallest rainfall—are certainly not unenviable as far as persona comfort is concerned.

SUMMARY.

Highest temperature in shade, 110°·2, at Adelaide, on January 13th.
Lowest temperature in shade, —44°·5, at Winnipeg, on January 3rd.
Greatest range in year, 133°·0, at Winnipeg.
Least range in year, 24°·6, at Colombo, Ceylon.
Greatest mean daily range, 22°·4, at Winnipeg.
Least mean daily range, 10°·4, at Colombo, Ceylon.
Highest mean daily temperature, 80°·3, at Colombo, Ceylon.
Lowest mean daily temperature, 29°·7, at Winnipeg.
Driest station, Adelaide ; mean humidity, 57.
Dampest station, Winnipeg ; mean humidity, 82.
Highest temperature in sun, 169°·3, at Adelaide.
Lowest temperature on grass, —22°·0, at Toronto.
Greatest Rainfall, 82·14 inches, at Colombo, Ceylon.
Least rainfall, 17·97 inches, at Malta.
Most cloudy station, Toronto ; average amount, 6·5.
Least cloudy station, Malta ; average amount, 3·3.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1884.

Station.	Absolute.				Average.					Absolute.		Total Rain.		Average.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity	Max in sun.	Min. on grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.										
England, London.	92·0	August 11	25·3	November 25	59·3	43·6	51·5	44·0	78	125·4	21·4	20·34	150	6·2
Malta	94·6	July 19	41·2	February 23	70·9	58·8	64·9	56·2	77	149·0	36·0	17·97	68	3·3
Mauritius	86·0	Jan. 9, Dec. 19	54·1	August 22	79·4	68·2	73·8	64·3	75	138·5	46·2	45·80	174	5·4
Calcutta	103·7	April 14	50·0	February 11	85·9	69·9	77·9	69·1	78	163·6	37·6	62·61	116	4·2
Bombay	92·4	April 4	61·6	Jan. 29, Feb. 1	85·2	73·7	79·5	71·1	76	149·9	49·0	75·44	110	3·7
Ceylon, Colombo.	93·4	February 19	68·8	Jan. 24, Feb. 4	85·5	75·1	80·3	71·7	75	150·0	59·0	82·14	159	5·7
Melbourne	100·7	February 13	33·0	August 1	66·8	48·7	57·8	46·6	71	158·0	24·5	25·85	128	6·2
Adelaide	110·2	January 13	35·2	July 23	71·4	53·0	62·2	...	57	169·3	26·5	18·74	138	5·0
Wellington	79·0	February 23	32·0	August 7	59·9	47·9	53·9	...	...	145·0	29·0	65·11	167	...
Auckland	77·5	January 9	37·0	June 1	63·4	51·8	57·6	48·4	72	149·0	27·0	38·07	203	6·1
Jamaica, Kingston	92·7	September 18	62·3	February 7	86·3	70·7	78·5	70·5	79	..	...	26·24	...	4·8
Toronto	89·6	August 19	—13·3	December 19	51·9	34·9	43·4	37·7	76	148·0	—22·0	28·55	182	6·5
Fredericton	92·7	June 29	—34·5	January 29	50·2	28·7	39·4	34·0	78	...	...	53·97	188	6·0
Winnipeg	88·5	June 22	—44·5	January 3	40·9	18·5	29·7	29·2	82	...	...	24·13	113	5·5

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	57·8	12	27·6	21	49·9	38·7	39·4	83	79·2	20·8	2·86	18	6·6
Malta	73·5	22	42·2	15	62·8	51·1	48·8	80	126·0	37·4	·33	5	3·1
Cape of Good Hope	94·0	8	51·5	4	81·2	60·7	...	...	...	...	2·12	6	2·3
Mauritius	86·7	1	68·8	15	84·7	74·3	70·6	77	139·1	63·3	2·16	14	6·0
Calcutta	85·0	28	51·7	21	79·0	59·9	58·5	72	144·7	40·2	2·02	8	3·7
Bombay	83·8	19	60·6	11	80·3	65·3	60·5	65	138·6	48·4	·00	0	1·0
Ceylon, Colombo	95·8	22	70·4	5	88·0	72·8	69·1	68	148·5	63·8	·75	3	4·9
Melbourne	101·6	5	46·1	3	76·9	55·2	52·4	67	157·6	37·9	2·74	8	6·2
Adelaide	103·8	4	50·7	8	80·6	61·1	50·5	48	157·2	41·0	·91	7	4·8
Wellington	76·0	14	49·0	6	69·1	55·4	...	...	146·0	44·0	1·92	7	...
Auckland	79·0	14	54·0	5	74·2	57·9	53·5	64	149·0	43·0	·17	3	4·4
Jamaica, Kingston	86·9	21	65·8	20	84·0	68·7	69·8	84	...	53·3	·01	1	2·3
Barbados	80·0	6*a*	65·0	12	78·0	69·0	69·0	79	142·0	...	2·12	9	5·0
Toronto	36·6	10	—14·9	2	19·2	0·1	10·0	82	110·0	—19·0	1·82	13	...
New Brunswick, Fredericton	37·9	10	—23·2	12	23·6	— 3·2	9·0	87	...	...	3·47	10	4·8
Manitoba, Winnipeg	36·7	27	—42·5	9	3·0	—19·4	— 0·5	87	...	...	·44	8	4·3
British Columbia, Victoria	58·0	19	27·0	22	49·5	38·8	...	...	...	...	3·84	16	...

a And 7, 19

REMARKS, FEBRUARY, 1885.

MALTA.—Mean temp. 56°·0; mean hourly velocity of wind 11·3 miles; sea temp. fell to 58° on 15th, but rose again to 62° on 21st, remaining at that point to the close of the month; H on 10th. J. SCOLES.

Mauritius.—Rainfall 2·83 in. below and mean temp. 0°·4 above the average; mean hourly velocity of wind 2·5 miles below average; extremes 22·6 miles and 1·9 miles; prevailing direction E. to E. by N. T and L on six days, L alone on six. Very heavy sea on 24th and 25th from N. and N.W. C. MELDRUM, F.R.S.

Melbourne.—Rainfall ·79 in., and amount of cloud ·9 above average; mean temp. of air 1°·4, and of dew point 0°·8 below average; mean humidity slightly above, and pressure slightly below average. Prevailing winds S. and W., strong on four days. TS8 on 12th and 18th; T on three days, L on two. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean min. temp. only 0°·8 below the average; but mean max. 2° lower than any previously recorded for February, and nearly 6° below the average of 28 years; the temp. reached 90° on only five days. The mean amount of cloud was in excess of any previous record, being about equal to the midwinter average. C. TODD.

Wellington.—First three days dull and showery, with strong N.W. winds; from 5th to 23rd, fine bright and warm, with heavy dews at night and moderate winds, except on the 9th, 10th and 11th, when it blew strongly from N.W.; 24th to 26th, dull and showery; 27th and 28th fine and bright; on the whole a pleasant seasonable month. Rainfall little more than half the average; mean temp. slightly below and pressure slightly above the average; slight earthquake on 19th. R. B. GORE.

Auckland.—Remarkably fine and dry throughout, with light variable winds; rainfall the lowest yet recorded for the month. T. F. CHEESEMAN.

JAMAICA.—The rainfall over the whole island was only one half the average, and the drought was severely felt over the greater part. MAXWELL HALL.

BARBADOS.—Mean temp. (73°) average; rainfall 41 per cent. below average. Prevailing wind N.E., mean hourly velocity 15 miles, being 30 per cent. above the average of 11 years; extremes 20 miles and 8 miles. R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	62·6	20	26·5	8	49·4	33·0	33·6	76	78·7	28·0	1·65	7	5·8
Malta	82·2	11	46·6	26	65·7	52·1	49·3	77	131·3	41·1	0·17	5	2·5
Cape of Good Hope	96·0	3	47·0	9	79·6	57·5	...	...	...	...	1·15	4	3·1
Mauritius	85·0	8	69·8	23	83·5	72·8	69·4	78	142·9	61·1	5·73	15	5·8
Calcutta	98·7	29	62·4	9	91·1	70·1	67·6	70	154·9	50·0	1·01	2	2·5
Bombay	90·9	30	65·0	3	84·4	72·2	69·2	74	144·3	53·6	·00	0	1·5
Ceylon, Colombo	91·2	30	72·6	13	88·4	77·2	76·2	81	147·2	59·8	5·71	9	2·6
Melbourne	95·2	18	42·5	21	72·7	52·3	49·4	66	142·1	30·6	2·39	12	5·8
Adelaide	93·6	17	45·8	20	75·8	56·1	47·5	51	154·2	34·4	0·33	7	4·4
Wellington	72·0	2,6*	46·8	20	66·4	54·2	...	...	145·0	39·0	3·43	13	...
Auckland	77·5	2	49·0	18	70·4	56·5	52·9	68	140·0	40·0	2·36	15	5·0
Jamaica, Kingston	92·2	24	64·3	1	85·5	68·6	69·9	81	...	...	0·29	...	2·4
Barbados	81·0	15	68·0	var.	79·0	69·0	69·5	77	141·0	...	2·07	12	5·0
Toronto	43·3	31	30·8	9	27·1	9·2	14·5	79	116·0	-12·8	1·22	14	...
New Brunswick, Fredericton	48·8	28	-15·3	24	28·9	3·0	14·2	77	...	...	3·92	16	4·7
Manitoba, Winnipeg	40·6	30	-34·5	...	21·7	-5·8	8·3	84	...	...	1·12	7	5·5
British Columbia, Victoria	67·0	17	32·0	3	55·2	37·1	...	...	...	...	0·32	3	...

* And 14.

REMARKS, MARCH, 1885.

MALTA.—Mean temp. 57°·5; mean hourly velocity of wind 9·7 miles; sea temp. ell from 62° to 61°. J. SCOLES.

CAPE OF GOOD HOPE.—Max. temp. 1°·1 below average; min. temp. 0°·2 above average. W. ELLERTON FRY.

Mauritius.—Rainfall 1·51 in., mean temp. 0°·3, and mean hourly velocity of wind 1·5 mile below their respective averages; prevailing wind E.S.E., extremes of velocity 22·9 miles on 13th and 1·6 mile on 6th. T or L or both on 7 days.
C. MELDRUM, F.R.S.

Colombo.—TSS on 4 days and L on 2 other days.—F. C. H. CLARKE, Major R.A.

Melbourne.—Mean temp. of air 2°·3, and of dew point 2°·9; humidity 2, and pressure ·043 in. below the average; rainfall ·22 in., and amount of cloud ·3 above. Prevailing winds W. and S. strong on 5 days. L on 3 days, T on 1.
R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure, average; mean temp. (66°·0) 4°·8 below the average of 28 years and far the lowest during that period. The chief defect was in the max. readings, the mean being 6°·2 below the average; weather generally fine and pleasant.
W. E. COOKE.

Wellington.—A wet month, especially in the early part, and frequently stormy. Mean temp. (60°·3) 2°·0 below average; R ·59 in. above average, L on 4 days.
R. B. GORE.

Auckland.—Showery and variable in the early part of the month; violent hurricane from N.E. on 14th; thence to the close fine. Rainfall and pressure, average; mean temp. somewhat below it. T. F. CHEESEMAN.

JAMAICA.—The rainfall, over the whole island, was only one-third of the average, and the drought was severely felt over the greater part. MAXWELL HALL.

BARBADOS.—Mean temp. 73°·3, about the average. Prevailing wind N.E.; mean hourly velocity, 14·2 miles; extremes, 19·3 miles and 8·2 miles; rainfall, 9 per cent. below the average. R. BOWIE WALCOTT.

WATER STORAGE.

To the Editor of the Meteorological Magazine.

SIR,—If the advice (page 100) about storing rainfall was taken it would at once make an enormous difference in the possibility of keeping down insect attacks.

To give just one instance, I went down into Buckinghamshire lately to see about Leaf-roller caterpillar attack. There was an enormous old oak, which it was a special object to bring round, and they *had* water supply, so I suggested getting the fire engine, and the tree was drenched and brought round.

If there was water supply we could save thousands and millions of pounds that go through "Turnip Fly," Caterpillars, &c., &c.

Yours very truly,

ELEANOR A. ORMEROD.

Dunster Lodge, Spring Grove, Isleworth, August 7th, 1885.

ATLANTIC TIDES AS STORM WARNINGS.

To the Editor of the Meteorological Magazine.

SIR,—The object of my letter on the above subject was to draw attention to the fact, which is indisputable, that the Atlantic *does* rise on the western shores for a considerable period before the approach of a storm, and to invite the attention of observers, favourably situated, to ascertain the data in connexion therewith.

I am now informed that the period extends to four and even six days under favourable circumstances, and if this can be maintained by observation, little more need be said to establish the importance of the phenomenon. Until then it is perhaps premature to attempt to theorize on the subject. Yours, &c.,

G. WOULFE BRENAN, C.E.

Craigvarren, Oban, N.B.

WATERSPOUT OFF SHEERNESS.

To the Editor of the Meteorological Magazine.

SIR,—It may be of interest to some of your readers to know that a waterspout was observed just off the Nore Point, Sheerness, between 2 and 3 p.m. on the 20th ult. After the usual *modus operandi* of this phenomenon was complete, the spout was drawn up into the cloud, which took part in its formation. This cloud, thus heavily charged with water, then moved inland in a nearly due southerly direction, apparently to the range of hills which forms the backbone of Kent, discharging its contents as it proceeded. No damage is reported to have been done in its track; indeed, it was rather the reverse, as the pastures, &c., were much refreshed by the rainfall, which was greatly needed. A thunderstorm, with hail, and heavy passing showers, occurred later on in the afternoon.

R. MONTAGUE MERCER.

Rodmersham House, near Sittingbourne, September, 1885.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	5·48	XI.	Rhayader, Nantgwillt..	8·19
,,	Margate, Birchington...	3·85	,,	Carno, Tybrith	5·68
,,	Littlehampton	4·56	,,	Corwen, Rhug	5·22
,,	Hailsham	4·89	,,	Port Madoc	7·01
,,	I. of W., St. Lawrence.	3·81	,,	I. of Man, Douglas	6·00
,,	Alton, Ashdell.....	5·92	XII.	Stoneykirk, Ardwell Ho.	4·37
III.	Winslow, Addington ...	4·51	,,	Melrose, Abbey Gate...	3·71
,,	Oxford, Magdalen Col...	4·36	XIII.	N. Esk Res. [Penicuick]	5·10
,,	Northampton	3·65	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	2·93	,,	Glasgow, Queen's Park.	5·01
,,	Wisbech, Bank House..	3·65	XV.	Islay, Gruinart School..	7·66
IV.	Southend	...	XVI.	St. Andrews, Newton Bk.	4·55
,,	Harlow, Sheering	3·71	,,	Balquhidder, Stronvar..	11·49
,,	Rendlesham Hall	5·75	,,	Dunkeld, Inver Braan..	5·56
,,	Diss	5·49	,,	Dalnaspidal H.R.S. ...	9·29
,,	Swaffham	4·57	XVII.	Keith H.R.S.	3·46
V.	Salisbury, Alderbury...	4·99	,,	Forres H.R.S.	3·07
,,	Warminster	5·14	XVIII.	Strome Ferry H.R.S....	9·97
,,	Calne, Compton Bassett	4·27	,,	Lochbroom	6·81
,,	Ashburton, Holne Vic..	7·79	,,	Tain, Springfield.....	2·94
,,	Holsworthy, Clawton...	6·90	,,	Loch Shiel, Glenaladale	17·96
,,	Hatherleigh, Winsford.	8·34	,,	Invergarry	8·68
,,	Lynmouth, Glenthorne.	5·81	XIX.	Lairg H.R.S.	8·33
,,	Probus, Lamellyn	6·46	,,	Forsinard H.R.S.	4·40
,,	Wincanton, Stowell Rec.	6·06	,,	Watten H.R.S.	3·97
,,	Wells, Westbury.....	4·98	XX.	Dunmanway, Coolkelure	10·57
VI.	Bristol, Clifton	4·84	,,	Fermoy, Gas Works ...	4·62
,,	Ross	3·13	,,	Tralee, Castlemorris ...	4·22
,,	Wem, Sansaw Hall.....	3·06	,,	Tipperary, Henry Street	3·14
,,	Cheadle, The Heath Ho.	3·53	,,	Newcastle West	5·25
,,	Worcester, Diglis Lock	3·57	,,	Miltown Malbay.....	6·82
,,	Coventry, Coundon	2·83	,,	Corofin	...
VII.	Melton, Coston	2·89	XXI.	Carlow, Browne's Hill..	5·20
,,	Ketton Hall [Stamford]	3·01	,,	Navan, Balrath	3·88
,,	Horncastle, Bucknall ...	3·66	,,	Mullingar, Belvedere ...	5·45
,,	Mansfield, St. John's St	2·98	,,	Athlone, Twyford	7·20
VIII.	Macclesfield, The Park.	4·31	XXII.	Galway, Queen's Col....	5·51
,,	Walton-on-the-Hill.....	4·64	,,	Clifden, Kylemore	11·26
,,	Lancaster, South Road.	4·36	,,	Crossmolina, Enniscoe..	7·27
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	4·70
IX.	Wakefield, Stanley Vic.	1·94	XXIII.	Dowra	...
,,	Ripon, Mickley	2·80	,,	Rockcorry.....	5·53
,,	Scarborough.....	2·53	,,	Warrenpoint	6·08
,,	East Layton [Darlington]	...	,,	Newtownards	3·77
,,	Middleton, Mickleton..	2·76	,,	Belfast, New Barnsley..	5·97
X.	Haltwhistle, Unthank..	2·59	,,	Cushendun	4·62
,,	Shap, Copy Hill	6·77	,,	Bushmills	5·77
XI.	Llanfrechfa Grange	6·59	,,	Stewartstown	5·70
,,	Llandovery	7·28	,,	Buncrana	4·84
,,	Castle Malgwyn	6·01			

SEPTEMBER, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	4·30	+ 1·79	1·48	10	19	76·5	15	33·7	27	0	3
II.		Maidstone (Hunton Court)...	3·67	+ 1·36	1·25	16	18	...	...	...	...	...	...
,,		Strathfield Turgiss	4·26	+ 1·96	1·64	10	12	74·0	15	31·4	26	1	3
III.		Hitchin	3·86	+ 1·38	1·56	10	22	68·0	15	31·0	26	2	...
,,		Banbury	3·50	— ·69	1·12	10	21	73·0	15	30·0	28	2	...
IV.		Bury St. Edmunds (Culford)	4·27	+ 1·49	·91	10	21	75·0	15	28·0	26	2	...
,,		Norwich (Cossey)	4·65	+ 1·57	·80	10	23	74·5	15	32·5	27	0	4
V.		Weymouth(LangtonHerring)	3·18	...	1·15	10	17	...	...	...	...	...	...
,,		Barnstaple.....	6·88	+ 2·60	2·15	10	20	73·0	7	38·0	26	0	...
,,		Bodmin	8·74	+ 3·50	3·02	10	23	65·0	4, 14	36·0	27	0	2
VI.		Stroud (Upfield)	3·89	+ ·64	1·28	10	18	72·0	17	30·0	27	1	...
,,		ChurchStretton(Woolstaston)	4·08	+ ·61	·60	10	25	68·0	15	35·0	26	0	...
,,		Tenbury (Orleton)	3·78	+ ·43	·98	10	23	71·8	15	27·0	28	3	3
VII.		Leicester	3·16	...	·88	10	18	76·0	15	31·6	28	1	7
,,		Boston	3·11	+ ·50	·69	10	19	75·0	15	34·0	26	0	...
,,		Grimsby (Killingholme).....	2·72	— ·35	·41	4	21	70·5	15	35·0	26	0	...
,,		Hesley Hall [Tickhill].....	1·66	...	·28	8	18	77·0	15	31·0	26	1	...
VIII.		Manchester (Ardwick).....	4·46	+ ·69	1·03	2	24	69·0	15	36·0	28	0	...
IX.		Wetherby (Ribston Hall) ...	2·89	— ·19	·72	3	16	...	...	...	...	...	...
,,		Skipton (Arncliffe)	7·45	+ 1·87	1·04	2	26	68·0	1	31·0	27	2	...
X.		North Shields	2·46	+ ·14	·39	28	18	71·5	15	32·5	26	0	1
,,		Borrowdale (Seathwaite).....	18·90	+ 5·68	2·45	12	26	63·9	6	32·0	27	1	...
XI.	WALES.	Cardiff (Ely).....	6·25	+ 1·45	1·62	10	22	...	...	...	...	...	...
,,		Haverfordwest	8·84	+ 3·79	1·37	6	20	67·0	6	30·0	26	1	4
,,		Plinlimmon (Cwmsymlog) ...	8·39	...	·85	28	24	...	...	...	...	...	...
,,		Llandudno.....	2·96	— ·79	·75	30	19	66·8	4	40·2	26	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	7·30	+ 2·89	·98	28	18	65·0	3, 7	30·2	27	1	...
,,		Jedburgh (Sunnyside).....	2·13	— ·46	·34	26	17	65·0	6	30·0	1, 27	2	...
XIV.		Douglas Castle (Newmains)	5·98	+ 1·58	1·06	11	20	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	10·97	+ 5·21	1·46	11	26	...	...	...	...	...	...
,,		Oban (Craigvarren)	10·19	...	1·31	20	26	64·3	7	34·0	27	0	...
,,		Mull (Quinish).....	10·75	...	1·27	12	27	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·90	+ 1·67	1·20	13	15	...	...	...	...	...	...
,,		Arbroath	3·52	+ ·45	·73	8	15	64·0	6	35·0	27	0	...
XVII.		Braemar	4·93	+ ·99	·80	4	21	64·0	1	26·0	27	2	7
,,		Aberdeen	3·90	...	·83	20	22	65·0	19	32·0	26	1	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	3·17	+ ·27	...	...	...	65·4	4	32·0	1, 27	2	4
XIX.		Dunrobin	4·51	...	·55	2	19	63·0	14	34·0	27	0	...
,,		Orkney (Sandwick)..... ..	3·78	+ ·29	·64	2	21	60·5	7	36·7	1	0	1
XX.	IRELAND.	Cork (Blackrock).....	6·30	+ 2·15	1·78	1	25	72·0	2	34·0	26	0	...
,,		Dromore Castle	7·61	...	1·45	18	23	66·0	10	35·0	26	0	...
,,		Waterford (Brook Lodge) ...	5·13	...	1·35	1	22	67·0	5	33·0	27	0	7
,,		Killaloe	5·46	...	·96	18	24	66·0	1	31·0	27	1	...
XXI.		Portarlington	3·52	+ ·34	·48	1	23	67·0	14	35·0	26	0	...
,,		Dublin (FitzWilliam Square)	2·86	+ ·45	·36	2	23	68·9	12	34·4	27	0	3
XXII.		Ballinasloe	5·30	+ 1·34	·92	18	23	65·0	2, 4	30·0	27*a*	3	...
XXIII		Waringstown	4·73	+ 1·38	·77	14	25	70·0	3	30·0	27	1	2
,,		Londonderry (Creggan Res.).	4·43	...	·63	28	26	...	...	...	...	...	...
,,		Omagh (Edenfel)	5·43	+ 1·39	·83	4	27	62·0	12	30·0	26	...	..

a And 28.

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather, after the first week, was broken and unsettled, rendering the in-gathering of the harvest a slow and tedious business. The rainfall of the 11th was the heaviest in 24 hours ever recorded here in September. T on 25th. Ivy in bloom on 11th.

HITCHEN.—The coldest September for thirty years, and one of the wettest.

BANBURY.—Mean temp. (52°·5), 4° below the average. Harvest in the neighbourhood almost all secured in fair condition by the close of the month. Kidney beans and dahlias much injured by frost on the 28th. T and L on 7th; high wind on 10th and 15th.

CULFORD.—A very unsettled month, with T and L, and frequent heavy rains, and cold nights; on the 26th the frost cut down most of the bedding and other tender plants.

LANGTON HERRING.—Mean temp. nearly two degrees below the average of 13 years; the great cold from 25th to 28th inclusive was very remarkable, and S sleet and H fell at many places. Very stormy on 10th and 11th; heavy dew on 20th and 24th.

BODMIN.—A very cold September, with excessive rainfall, the fall on 10th far exceeded any other day's record during the 36 years that observations have been made. Mean temp. 56°·5.

WOOLSTASTON.—A month of constant R, most disastrous for the later harvest.

ORLETON.—A very stormy changeable month, with rainfall much above the average. The nights were generally cold, and the days cloudy, and frosts occurred on 26th, 27th and 28th; the wind was frequently very rough, and the showery weather delayed the in-gathering of the corn crops. Mean temp. about two degrees below the average of 24 years; pressure unsteady, but the fluctuations not great; distant T on 4th.

KILLINGHOLME.—R fell frequently, but not continuously, retarding harvest, but the air being cool, the corn did not suffer as might have been expected. T and L on 3rd, 4th and 5th.

MANCHESTER.—The month was very unsettled, and there were few fine days; the rainfall was considerable in quantity, but more marked by its continuance; the weather was cold on several days, with two or three degrees of frost a short distance from the City; a little T, but of small consequence.

SEATHWAITE.—In seven hours on the 11th and 12th, 4·27 in. of R fell, causing a flood that did much damage; and on 10 days, one inch or upwards fell. First S on hills on 23rd. H, T, L, and heavy R on 30th; T on 5th.

WALES.

HAVERFORDWEST.—The wettest September since 1866, when the rainfall was 9·51 in. on 23 days. Fortunately it was never stormy, although fresh high wind prevailed in the dry intervals, neither was the air warm and close, or the consequences would have been most disastrous. Fully one half of the harvest was still in the fields at the close—a melancholy dashing of high hopes, no season of late years equalled it in quality of straw and grain. It was as wet, though not as stormy, as the disastrous September of 1871.

LLANDUDNO.—Mean temp. 2°·0 below the average; monthly and diurnal range slightly less than the average. The first fourteen days were, although showery, fairly fine, the next 8 days were dry, bright, and very fine, and the remainder of the month was cold and showery; gale from S.W. on 11th, and very stormy on 24th and 25th, T and L on 24th; 127 hours of bright sunshine were recorded.

SCOTLAND.

CARGEN.—A very wet and stormy month; mean temp. 3°·2 below the average, the coldest September since 1860, when the mean temp. was 51°·6. The corn crops suffered very much from the excessive rainfall and gales of wind; T on 2nd, L on 13th.

JEDBURGH.—The month was marked by very low temp., a frost occurring on the 1st, which stopped the further growth of potatoes. Though there was a good deal of R, it was much needed for the root crops, and as the cold winds rapidly dried the corn in the fields, harvesting went on almost without intermission. In the higher districts much was still out at the close, but in good condition.

OBAN.—The rainfall was the most continuous in any month for some years, and the temperature was very low; the result being disastrous for the white crops which were far behind in quantity and quality. The rainfall on the 20th was constant and exceptionally heavy for seven hours; gales on 9 days, H on 24th.

QUINISH.—A very wet, cold, stormy month from first to last; very little corn secured in this district.

BRAEMAR.—A month of unsettled weather with occasional showers of S; very unfavourable for harvest work; crops short and much below the average.

ABERDEEN.—The weather was unsettled throughout the month, and the rainfall above the average. Auroræ seen on 12th and 15th; a beautiful lunar rainbow at 8 p.m. on 24th; vivid L on 3rd, H on 26th.

CULLODEN.—Harvest was retarded by the adverse weather, R falling in small quantities all through the month, with low temp. A very severe frost occurred on the morning of the 1st, injuring the potato crop.

DUNROBIN.—A wet month; bad harvest weather.

IRELAND.

DROMORE.—A wet and very cold month with some H showers; prevailing winds N.E. and N.W.; gales from S.W. towards the close.

WATERFORD.—A very wet and windy month; rainfall greatly above the average.

KILLALOE.—A very bad harvest month, with wind and R in excess; mean temp. 53°·3; sharp frost on 27th.

DUBLIN.—The weather was very unsettled, rainy, and cool during the greater part of the month. H on 10th, 25th, and 30th, aurora on 4th, solar halos on 11th and 22nd, fog on 14th and 17th, L on 5 days; mean temp. (53°·2) 1°·9 below the average; the month was decidedly cold, but not so cold as September 1866 (mean temp. 51°·9), 1873 (53°·0), 1877 (52°·4), 1882 (52°·0). Mean humidity, 83; mean amount of cloud, 4·9; prevailing winds W., S.W., and N.W.

BALLINASLOE.—A very wet and stormy month, doing great injury to the harvest; L and T on 2nd.

EDENFEL.—A more complete or unwelcome reversal of all the characteristics of the preceding summer months could not have taken place; not one "harvest day" broke the monotony of the cold, tempestuous, and thoroughly inclement weather which prevailed throughout the month; nearly half the grain was still in the fields at the close, and much of it uncut. Several swallows, driven back apparently by stress of weather, were to be seen at the close, and some in their summer nests dead.

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THE RAINBAND VINDICATED.

BY J. RAND CAPRON, ESQ., F.R.A.S.

(*Continued from p.* 132.)

One important requirement not yet fulfilled is a gauge or micrometer to estimate the tint and width of the rainband or bands. The width may be measured (though with difficulty in small instruments) by some form of moving web or point, but a comparison spectrum for tint is far more difficult to obtain. Mr. Mill made to me a very ingenious suggestion of the use of didymium for this purpose. This gives as a salt in solution, or as a component of glass, an absorption band, varying in tint with the thickness of the quantity of the solution or of the glass, and he proposed to use a sliding wedge-shaped cell or plate, and to adjust this till it accorded with the rainband.

Unfortunately the didymium band falls exactly in the place of a rather strong low sun band, on the more refrangible side of D, and is complicated by it. I propose to avoid this inconvenience by means of a reflecting prism so arranged that the light to pass through the didymium solution or glass shall come from the zenith. For micrometric measurement of the band width, and for comparing the didymium or any other selected band with the rainband, I know of no better arrangement than one illustrated below (fig. 4). In this case the slit plate is divided horizontally in two, and the upper half with its spectrum is made by means of a micrometer screw to traverse the lower half as shown in the diagram (fig. 5).

By this means measurements and comparisons may be easily made, *e.g.*, the D lines in the upper spectrum may be used to measure the width of the rainband in the lower, or the didymium band in the upper may be brought into direct comparison with the rainband. The D line or any other may also be brought over and compared with F or other of the solar lines. All these comparisons are thus rendered less difficult than when the bands and lines are a distance apart.

It has been proposed to place a "condensing lens" in front of the slit, but I do not for ordinary use see any advantage in it. The sky light cannot be condensed, and I doubt whether in any picture

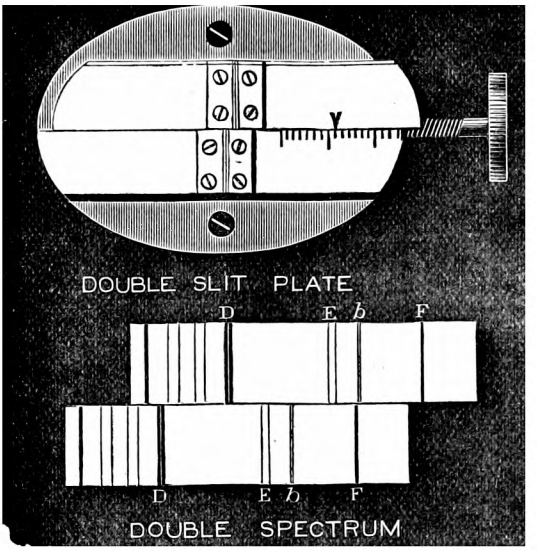


Fig. 4

Fig. 5

formed on the slit of a small spectroscope it would be possible to distinguish a cloud spectrum from that of the sky.

In the case of larger spectroscopes, with considerable slit length, the device might perhaps be more useful.

OBSERVATIONS AND THEIR RESULTS.

As the number of observers, evidenced by the sale of instruments, has increased, so also have the methods, quantity, and quality of the observations.

With regard to the methods, the more simple form of observation recommended by me in the "Plea" has been by some extended, and the lesser rainbands, the dry air bands, and the atmospheric lines other than D have all been enlisted into service. By the varying thickness and appearance of these, the judgment obtained from the larger rainband near D has been reinformed and strengthened.

Much information on this head will be found in Mr. Cory's "How to foretell."

That observer, too, has extended his scale from Prof. Piazzi Smyth's 10 to 20. After much experience, I still think the scale given in the "Plea," 0 to 5, is the more useful for general observers, except that I have introduced 0–1 as indicating a very faint band. Mr. Cory says "the rainband is never absent." This may be strictly true, but it is more convenient in practice to begin with 0 as indicating all that is seen in dry fine weather.

Mr. J. A. Bramley Moore in a letter to *Knowledge*, No. 60, p. 485, remarks:—"(2) If the sun lines in the green instead of appearing clear and distinct are thick and muddy, heavy rain (like thunder rain) will follow, and this whether there is any "rainband" in the red or not.

"(3). If on moving the spectroscope slightly to the left the "blue" appears very light, and the dark line down is clearly seen, then wind may be expected." He adds that this "never fails."

"(4) On one occasion on moving the spectroscope as above, the green instead of giving way to the blue, seemed to fight with it, and *pass over it.* A thunderstorm followed."

Twice since he found the same thing to occur. Mr. Cory, p. 30, corroborates this form of thunderstorm prediction.

Mr. Cory also notices that the rainband decreases before snow, and his diagram on Plate III. illustrates this.

He also recommends pointing the spectroscope to the direction from which the wind comes; a useful suggestion.

Coming now to the question of how far the spectroscope makes good its predictions, we have :—

(1) General evidence as afforded by the statements of Prof. Piazzi Smyth, Mr. Cory, Mr. Mill, Mr. Clapham, and others, who have borne testimony in favour of its value for forecasting.

(2). Recorded sets of observations, either daily or as averages for longer periods; and either in figures, or as lines and curves, expressing the result in a graphical form.

In a letter to the *Times* of September, 23, 1882, Prof. Piazzi Smyth gives a fortnight's notes, September 1st to 15th, 1882, in three columns—(1) Temperature, (2) Rainband intensity, (3) Rainfall at the Royal Observatory, Edinburgh. A glance at these will show how rain fell as the rainband increased, and how some small successive rainbands led up to a fall of rain.

Mr. Cory has not given statistics in his book, but in a letter to the *Times*, February 1st, 1881, he gives a list of observations taken at 9.15 a.m. daily for the month of January of that year. The results are as follows :—

1 case of	70%	rainband was followed by	heavy rain.
2 cases of	60%	„ „ „ „	rain in both.
8 „	50%	„ „ „ „	rain every time.
7 „	40%	„ „ „ „	rain in 5, overcast in 2 cases.
9 „	30%	„ „ „ „	6 of rain.
1 case of	40%	decreasing to 30% was followed by	nimbus.
1 „	30%	increasing to 40% „ „ „	rain.
1 „	20%	„ „ 30% „ „ „	slight rain and heavy snowfall.
1 „	20%	was followed by very fine weather.	

31 days.

These figures seem to be conclusive as to the rainband's predictive value.

To Mr. Cory I am also indebted for the graphical chart, a copy of which I give on Plate I., showing the mean per-centage of rainband

in dotted curves, and the amount of rainfall in vertical lines for each month during the year 1882 and a part of 1883, at Buckhurst Hill, Essex. The observations were taken in the N. direction, three times a day, and at an angle of from 10 to 20 degrees above the horizon. As Mr. Cory remarks in his accompanying letter to me, "there is a decided connection between the two." The high per-centage of rainband in June and July, with a not excessive fall, is due to the rainband being stronger in summer. The heavy fall in the later half of October was preceded by a very high mean rainband during the first half of the month. Of the fall in March, with a low rainband, half was snow, and the actual amount of rain was very small.

These apparent discrepancies are consistent with the rainband laws.

Mr. Mill, in his "The Rainband," gives a graphical chart and some tabular statements showing how his rainband predictions were fulfilled.

Tables II., III. and IV. in that work give the results when the rainband was compared in intensity with the Fraunhofer lines, *b* and *F*, during seven months of 1882.

These tables show there was 8 per cent. of cases when the rain *did not*, and 92 per cent. of cases when the rain *did*, follow maximum rainband; and 21 per cent. of cases when the rain *did*, and 79 per cent. of cases when the rain *did not* follow a minimum rainband.

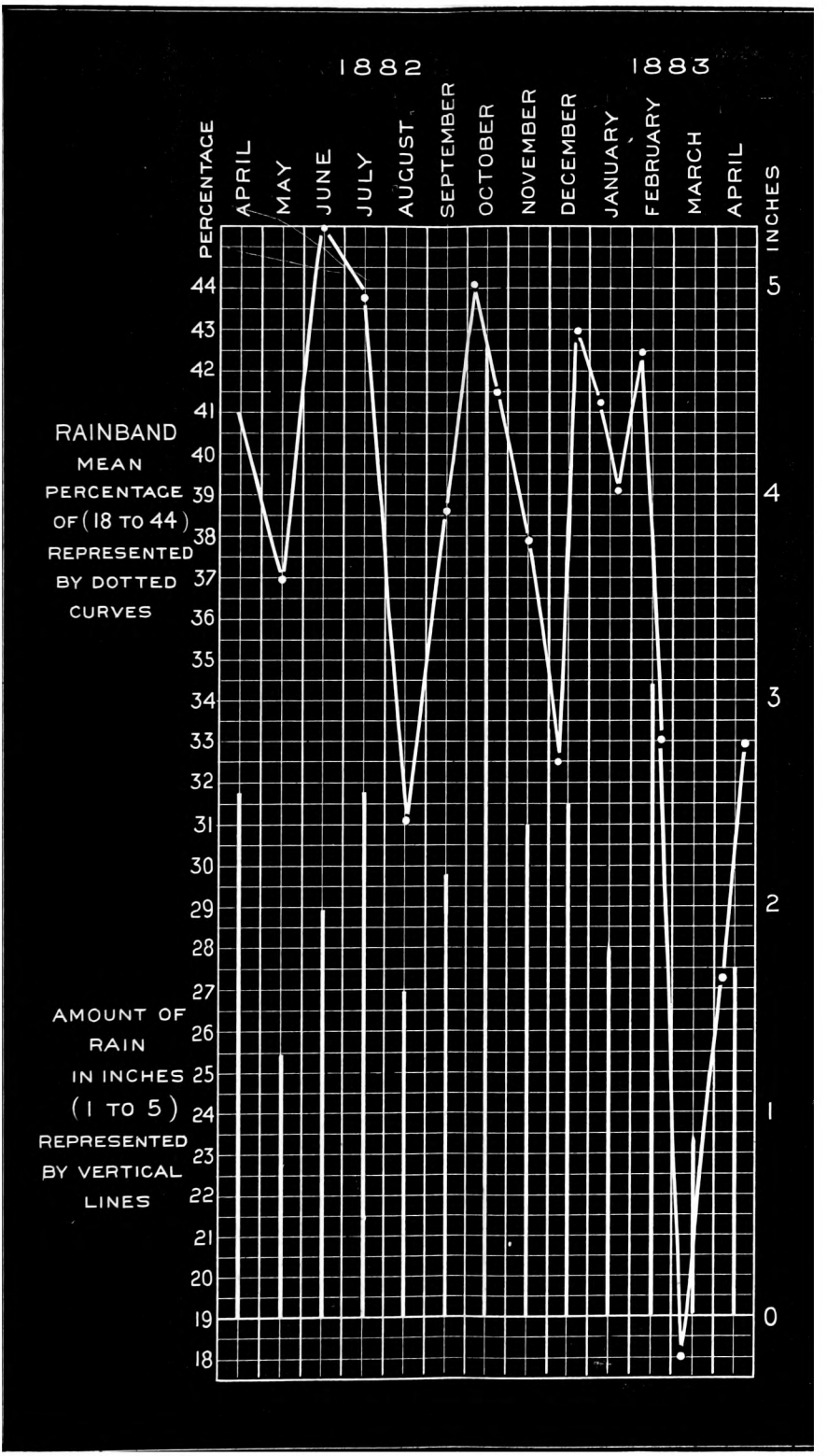
Table V. gives the result of observations made in Callander for the months June to December, 1882:—

Rain predicted	125
Rain followed	97
Per-centage of fulfilled predictions ...	78
No rain predicted...	80
No rain followed	51
Per-centage of fulfilled prediction	64
Total predictions	205
Total fulfilments	148
Per-centage of total fulfilled predictions...	=72

Table VI., for January to September, 1883, gives the total of fulfilled predictions at 209, and of unfulfilled 64. Per-centage of fulfilled predictions = 76·5.

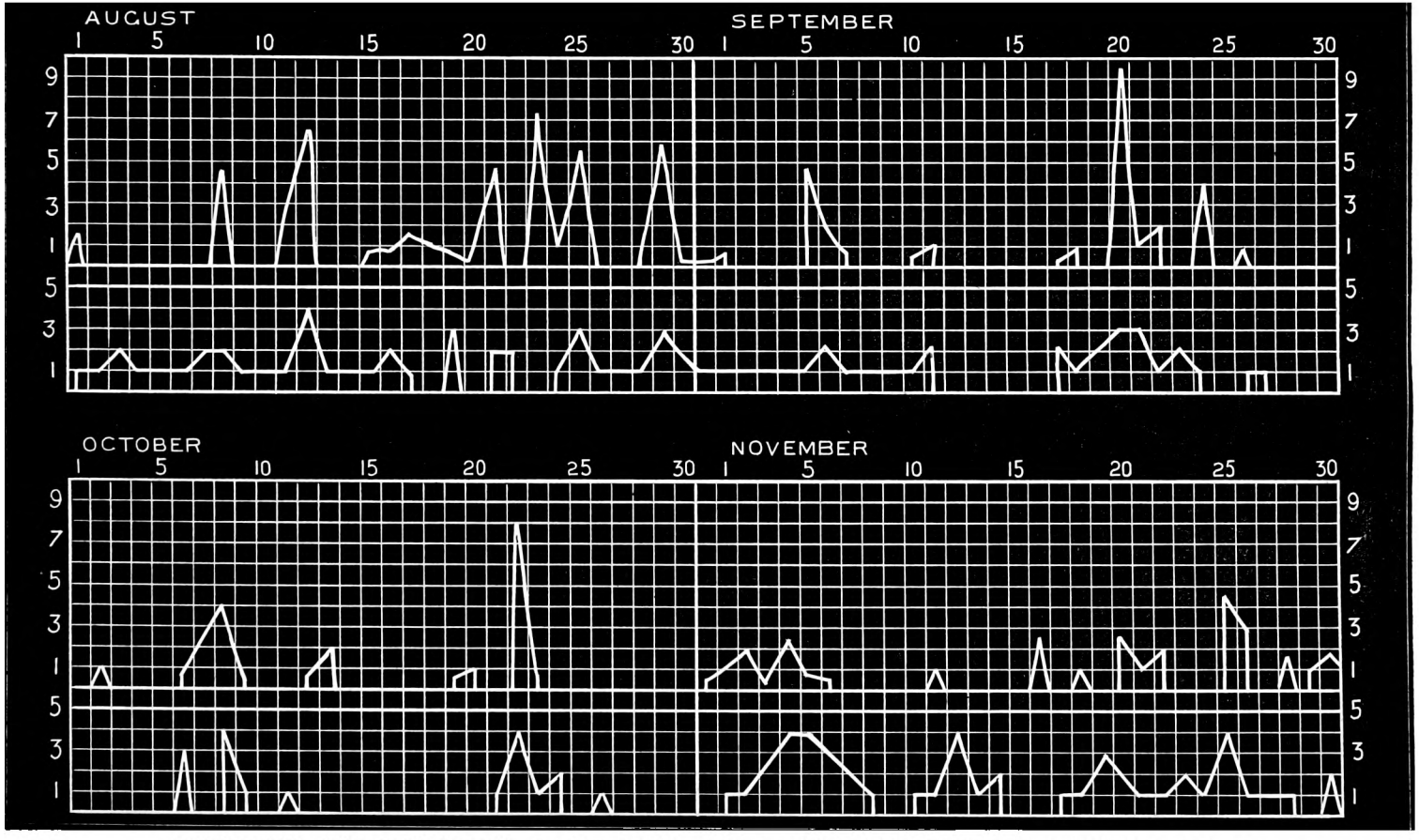
With respect to the Guildown observations, these have been taken since the 1st of July, 1880, at 9 a.m. daily, with the spectroscope, and in the manner mentioned in the "Plea." All the barometric and other meteorological observations for a half year are from time to time reduced to curves upon a chart, in which, in tenths of inches, the days of the year form the abcissæ, while the readings of each instrument form the ordinates. In these the rain is shown in tenths of inches of fall, and the rainband in degrees of strength 0—1 to 5.

Plate I.



MONTHLY RAINFALL AND RAINBAND, 1882-3.

Plate II.



RAINFALL AND RAINBAND AT GUILDOWN FOR FOUR CONSECUTIVE MONTHS OF 1881.

The rainfall and rainband portion of the chart for four consecutive months of 1881 is shown in Plate II.

These charts if put together would extend to a length of 12 feet 2 inches, and comprise over 1,800 observations. I have not tabulated the results except for yearly values, but a glance at the curves ought to convince the most sceptical that the connection between the rainband and rainfall is, as a general rule, well established.

The yearly values run out thus :—

Table of Yearly Values of Rain and Rainband.

YEAR.	Rainfall in inches.	Rainband in numbers.	
1881.....	25·68	353·5	
1882.....	28·10	392·5	1·0 of Rainband
1883.....	24·35	404·5	= ·60 of Rain.
1884..... ..	18·70	314·0	

It is obvious that if such a method of long-period comparison as this shows an approximate reciprocal rise and fall in the total values of rain and rainband it is as much as can be expected from it. If special circumstances prevail, such as fogs and mists, which give a low rainband without rain, we may expect to find (as in 1883 and 1884) an advance of total rainband over rain for that year.

Other observers doubtless have preserved records which have not come under my notice ; but taking Mr. Cory's, Mr. Mill's, and the Guildown ones alone, I think the fact is established that the little dark "bar" in the yellow of the spectrum can well hold its own in forecast with any other "bars," and that its character has been amply vindicated.

It now only remains to refer to one or two meteorological subjects allied to the rainband, but not generally finding a place with the observations of pressure, temperature, wind, &c. These are ozone, atmospheric electricity, and the weather compass for forecasting invented by the late Prof. Klinkerfues.

THE RAINBAND AND OZONE.

Mr. Cory, in his "How to Foretell," (p. 32) remarks that the blue and yellow colours in the spectrum are useful guides to the presence or absence of ozone. If the air is very pure, the blue will be clear, and F will stand out distinctly, while the yellow will show itself as a true colour or have an orange tint. If the reverse, the yellow will have a greenish hue, and the blue will be deep and dark, with an indistinct F.

I have not particularly observed these colour changes, but the meteorological charts above mentioned contain ozone curves on the same principle as those of the rainband, and for similar periods. The

scale for rainband is, as before, 0–1 to 5; that for ozone 1 to 10 of Negretti and Zambra's scale for their iodide of starch papers. A portion of one of the charts comprising four months (the first of each quarter of 1882) is given in Plate III. An examination of this will show that generally the curves of rainband and ozone agree in rising and falling together. It does not often occur that ozone is nil; but when it is, rainband also is found absent. This is indeed what might have been expected, for with warm winds, W. and S., the rainband is reinforced; with cold winds, N. and E., it is depressed. A similar effect, but even more regular in its action, is found with the ozone tests. Thus a S.W. wind gives the strongest tinted papers; a N.E. wind the lightest. We know so very little of ozone and its properties that it would not be safe to connect its quantity in the air with conditions of moisture, though such a connection may be fairly suspected.

Guildown is remarkable for exceeding in average quantity of ozone places situate much nearer the sea. This is probably due to its altitude of 225 feet, and to an open valley to the W. from which there is a prevalent air current.

ATMOSPHERIC ELECTRICITY.

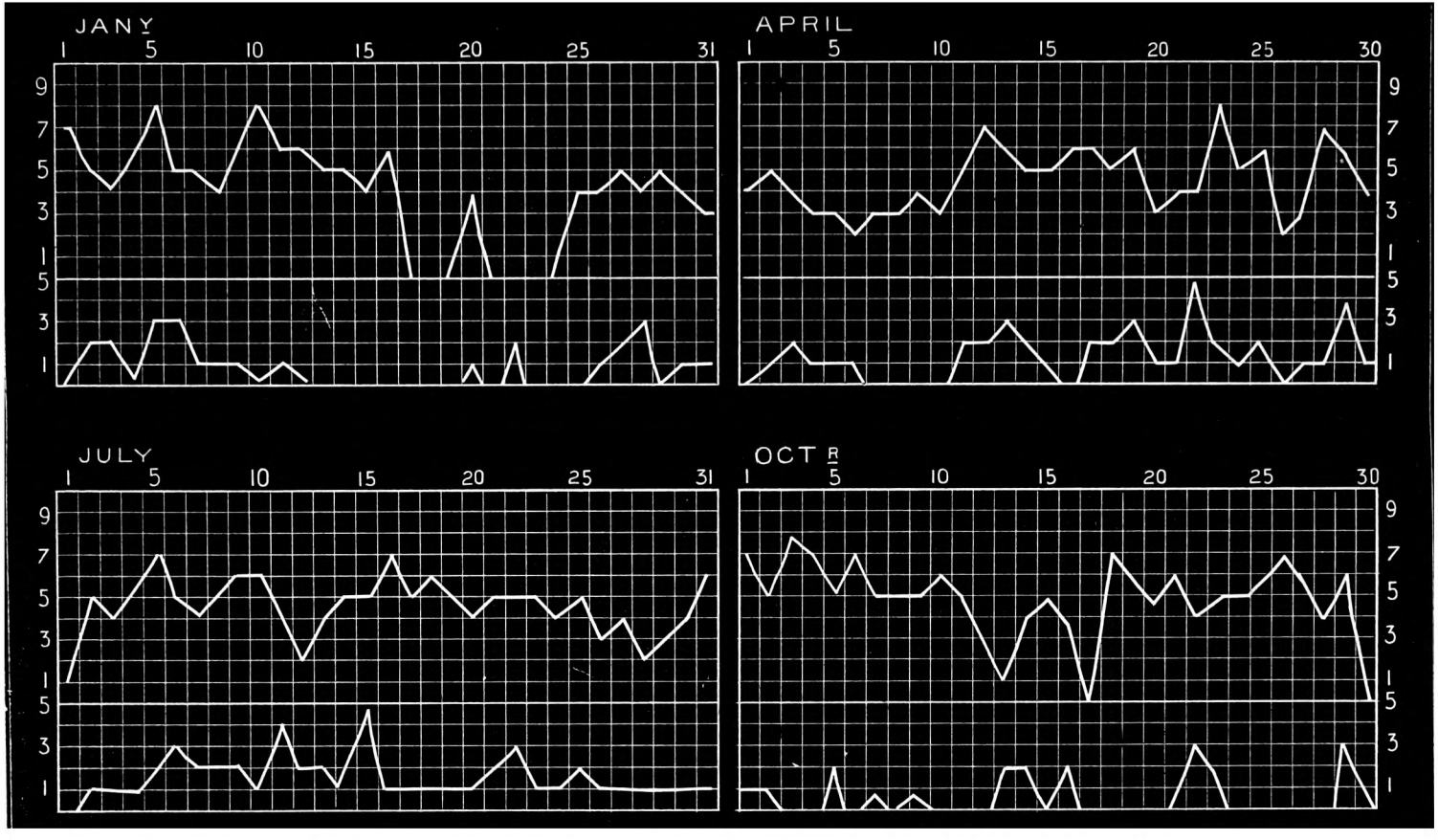
In the "Plea" I suggested that observations of atmospheric electricity might usefully accompany those of rainband. The relation of these to each other becomes more apparent when the influence of electricity upon aqueous particles is considered, and how the size of these latter determine the strength of the rainband.

When these are minute in the form of transparent water vapour, evidenced only by the hygrometer, the rainband is strong. When the particles are larger in the shape of visible fog or mist, the rainband considerably weakens. Lastly, when the gross particles fall as heavy rain-drops or snow-flakes, there is frequently no rainband, or hardly any. Now, the property of atmospheric electricity (as shewn in the familiar experiment of a sponge suspended from the prime conductor of an electrical machine) is, when developed, to cause the finer cloud particles, by mutual repulsion in the first instance, to coalesce and descend as rain. Electric action is always strongly marked when rain suddenly falls, even to the extent of yielding sparks from a properly insulated conducting wire, and it has evidently much to do with the breaking up of clouds. I have not traced, as Mr. Moore and Mr. Cory have, a forecast of storms by the aspect of the rainband, or the colours of the spectrum, but I have noticed a sudden increase of atmospheric electricity, and a weakening of the rainband frequently to accompany a clearing shower.

Those who desire to combine observations of atmospheric electricity with those of the rainband, will find the mode and the apparatus used fully described and illustrated in the *Meteorological Magazine* for August and October 1885.

The collecting is effected by means of elevated points, or a water stream, and the examination by a Bohnenberger suspended gold leaf

Plate III.



OZONE AND RAINBAND AT GUILDOWN FOR FOUR MONTHS OF 1882.

electrometer; or by a Thomson's quadrant electrometer, excited by a chloride of silver battery.

KLINKERFUES' WEATHER COMPASS.

Lastly, I have to notice an instrument invented by the late Prof. Klinkerfues, of Göttingen, for the purpose of weather forecast. It is an ingenious combination of an aneroid barometer, a string hygrometer, and a wind scale, jointly affording indications of the effects of pressure, moisture and wind. A general idea of its construction will be obtained from the annexed wood-cut.

In this drawing—*a* is the aneroid vacuum box; *b*, moveable weather scale; *s*, moveable wind scale; *c*, hygrometric hair string; *d*, segment actuating index; *e*, lever connecting barometric with hygrometric effects; *f* and *g*, arms to which the hair string is attached; *h*, lower end of index, the upper end of which projects on to the weather scale.

The working arrangement is such that in dry air conditions the hygrometer string acts *with* the barometer for a rise; and in moist weather *against* it; and the two instruments thus combine in a joint reading, depending on the variation of each. When fine weather is approaching, the hygrometer will give the barometer an extra "pull up," and in moist assist it in "a fall," while at times the two may balance one another.

In this way more variation is obtained than with the ordinary barometer, and the concurrent effects of pressure and moisture are read off.

To forecast, the method is this—

At any definite time, say 9 a.m., set the outer dial with the words describing the weather, "Rain," &c., with the inner wind dial, so that the word denoting the prevailing weather will stand against the wind direction at the time, *e.g.*, set the centre of the larger dial "Change" against the centre of the wind dial "North;" then turn *both* dials *together*, until the index covers the words "Change" and "North." Twelve hours after, we will suppose the index to have risen to "Fair," and the wind to have changed to the "West." We must now move the outer dial *only* in the wind direction, so as to correspond with the pointer "West."

This will bring "Change" again under the index, and indicate that the prospect of fair weather shown by the index rise has been neutralized by the wind change, and changeable weather may consequently be predicted. Had the wind gone Eastward with the index rise, the words "Set Fair" would have taken the place of "Fair," and continuous fine weather would have been foretold. Of course no meteorological instrument is infallible; but I may fairly say that with proper care in setting, much may be made of the "Klinkerfues" for weather forecasting. A friend of mine, a large farmer, has used one for years; and to quote his own words, "I always set my farm work by it."

To prevent disappointment in its use, it is necessary to remember:—

1. That its movements are relative, and are not intended to compare with those of the barometer, being on nearly twice the scale, and acted upon hygrometrically.

2. It must be set each time as before described for a forecast. If left alone with "Change" at top, the index will sometimes run right off the marked part of the dial, in consequence of the greater range.

When sent from abroad by the patentees (Messrs. Biernatzki & Co., of Hamburg), the index is secured to ensure safe travelling. This has to be released, and then set by a screw at the back of the case, either by a barometer, or to the prevailing weather sign. This setting should not afterwards be altered, the dials being in future adjusted to the index, and not it to them.

How sensitive the hygrometric action is, may be seen by breathing on the back of the case, when the index will at once be in movement.

The instrument, although now introduced some years, has not been so well received as it deserves, owing, as correspondents have told me, to the setting arrangement not being properly understood. It is, however, after a little practice, very simple. Though not in strictness an instrument fully adapted to scientific research (a divided scale would add to its value), it certainly merits attention, if it will only succeed in saving a hay crop, or telling the farmer how long his stacks may remain out, matters as to which his mercurial barometer sometimes misleads him. Probably a better acquaintance with it by meteorologists would more fully develope its qualities as an adjunct to the rainband spectroscope, for which it seems well adapted.

REVIEWS.

Stanford's Parliamentary County Atlas and Handbook of England and Wales. 8vo, 330 pages, 89 maps. London, Stanford.

TRULY we live in times of change; even our geography has constantly to be re-learned, for Mr. Stanford tells us that—

"The new Electoral Divisions, set up by the Redistribution of Seats Act, 1885, have for all Parliamentary purposes superseded the ancient and well-known County; it is therefore important that the area and contents of these new divisions should become generally known, and for this purpose the Atlas and Handbook will be found of great practical value.

"These new Electoral Divisions are based as far as possible upon the hitherto little known Petty Sessional Divisions, which have consequently been brought into considerable prominence. In this Atlas the boundaries and names of the new divisions are marked and written in red, and are further distinguished by various tints of colour."

If this handsome volume had given merely details of population, &c., no matter how good the maps might have been, it would have had little claim on our attention; it would have been indispensable, or nearly so, to aspirants for Parliamentary honours, but meteorologists might have passed it by.

The title is, however, deceptive, not in a bad sense, but in a good one, for the book contains much more than anyone would expect: it contains, besides about 60 county and town maps, the following physical and statistical maps:—Geological Map of Great Britain, Orographical Map of Great Britain; and for England and Wales—River Basins, 24 Maps of Monthly Rainfall, Air, and Sea Temperature and Barometric Pressure, and one each giving the following particulars:– Population, Occupation, Agriculture, Coalfields, Death Rate, Registration Counties, Parliamentary Representation, Dioceses of the Established Church; also maps of the Isle of Man, Jersey, Guernsey, and the smaller Channel Islands.

The non-political portion of the volume is crammed with information, and, carefully studied, would teach most persons much of what they know too little about—their own country.

The first two maps are very suggestive; they are on exactly the same scale, one, the geological, is tinted in accordance with the nature of the soil, the other, the orographical, in accordance with its elevation; and thus the intimate relation between the hardness of the rocks and the altitude of the hills and mountains is at once apparent.

The next map is, for a moment, rather puzzling. It is a geographical map, with the county names, &c., in large type, but it is coloured according to the river basins. Usually in a watershed map the names of the rivers are printed so large, and those of the towns so small, that it is not easy to realise the geographical position of the boundaries. In this map the only special indication of the rivers is well-arranged colouring, and hence one learns a lesson which it is quite possible that even the publisher did not intend to teach. In some cases the lettering is almost amusingly in harmony with the

colour, *e.g.*, Durham, the normal shape of which is very approximately represented by the basin of the river Wear.

We now come to that which really constitutes a very valuable contribution to meteorology, viz., a set of 24 maps—two for each month. They are arranged in pairs, the two for each month lying open at once. They are all on one scale, and represent England and Wales on the scale of about 100 miles to an inch; as, however, they are beautifully engraved, the smallness of the scale is rather an advantage than otherwise.

The information given is—

(1.) On the first map. Monthly isothermals of air temperature, by Alexander Buchan, Esq., F.R.S.E. (who also contributes two pages of remarks upon the maps).

(2). Coloured shading round the coast, showing the monthly mean temperature of the sea, taken, we believe, from the "Meteorological atlas" published by the Meteorological Office.

(3). On the second map. Coloured rainfall maps, prepared from the tables compiled by G. J. Symons, Esq., F.R.S., from the records of 366 stations during the fifteen consecutive years, 1866–80. The accuracy of these maps is only equalled by the clearness of the printing. We wish that every rainfall observer could have a copy, for they are not merely good, but the only maps of the kind in existence.

(4). Isobars for each ·02 inch of atmospheric pressure. These are, we think, based on the same data as (2).

After this series, follows a map, representing the density of population (showing, by-the-bye, one fact of which we were not aware, viz., that the northern part of the county of Nottingham is more populous than much of Lancashire). The next map, by a mode of colouring new to us, gives a mass of information as to the occupations of the people, even specifying the class of fish caught on the various coasts. We must, however, refrain from describing the rest of the maps, and conclude by congratulating the publisher on the success of his work (many portions of which ought to have been compiled by Government), a work which, whether it pays or not, will always redound to his credit.

Crowborough. — Observations upon the Topography and Climate of Crowborough Hill, Sussex, together with other subjects of collateral interest. By C. LEESON PRINCE, M.R.C.S., F.R.A.S., F.R.Met.Soc., &c. Privately printed. 8vo, 1885.

HAVING been carefully through this book, we begin our remarks by expressing regret that a useful and interesting monograph should not be rendered generally accessible by copies being placed for sale in the hands of a publisher.

Mr. Prince has probably done more for Sussex meteorology than any one living or dead. The present book is in some respects a sup-

plement to his larger work on *The Climate of Uckfield*, and we hope that, like it, a new edition of Crowborough will soon be accessible to the general public.

Crowborough is a new, and we think desirable, inland health resort, nearly 800 feet above sea level, and about seven miles south-west of Tunbridge Wells. It is formed of the Hastings Beds (or Hastings Sands, as they used to be called), which rest upon the Great Wealden formation of the south-east of England. The view from many parts of Crowborough, but especially from Mr. Prince's Observatory, is exceptionally fine, and Mr. Prince gives a list of (107) churches and (41) important objects which he has been able to identify. He does not give their distances from Crowborough, but among them we notice :—

Lydd Church, Kent (near Dungeness),	which is	34 miles	E.S.E.
Fairlight Church, Sussex (near Hastings),	,,	25 ,,	S.E.
Dyke House, Brighton, Sussex,	,,	20 ,,	S.W.
Leith Hill, Surrey,	,,	24 ,,	W.N.W.

Altogether we calculate that the landscape must include quite 800 square miles, or about half a million acres.

As regards the climate, Mr. Prince's remarks carry the weight of nearly half a century's experience in continual registration, and of the use of none but the best instruments. Although not himself an admirer of Stevenson's stand, he has kept duplicate records of thermometers exposed according to his own system, and of others in a Stevenson screen. We cannot, in the space here available discuss fully the *pros* and *cons* respecting the exposed thermometers. Mr. Prince has devoted many pages to printing full abstracts of the results, and has thus enabled observers to compare them for themselves. One fact will probably be a surprise to many, viz., that the average daily maximum by a bright bulb mercurial thermometer exposed to the sun 4 ft. above the ground is, even in July, only 5°·7 higher than that in a Stevenson screen, and, on the average of many years, is only 3°·8 higher. The explanation lines in several factors : (1) a bright bulb full of mercury is virtually a spherical mirror, and reflects a very large proportion of the heat it receives ; (2) the bulb is free to radiate its heat to the sky ; (3) the bulb is at times wetted by rain, and then it gives the temperature of the wet bulb instead of that of the dry bulb.

The winter temperature of Crowborough, though low, is very equable, more so even than that of Torquay, Llandudno, or Barnstaple.

The book all through is interesting, useful, and full of suggestive remarks ; *e.g.*, "I have found upon many occasions that the lowest temperature occurs very generally between the hours of nine and ten in the evening, and subsequently shows a tendency to rise without falling again during the night. It is quite possible that this feature obtains generally upon high ground." Yes, very probably ; if so, how desirable to get a thermograph, and to determine the hourly corrections.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	72·8	20	29·3	4	58·4	39·7	39·2	73	112·8	22·3	2·32	11	5·7
Malta	74·2	8	47·8	2	67·3	53·6	51·8	76	130·3	40·8	·59	6	3·2
Cape of Good Hope	90·4	14	41·0	24	72·3	52·8	...	...	...	...	1·92	10	5·0
Mauritius	83·8	13	65·0	26	82·2	71·7	68·0	76	134·5	53·1	1·41	12	4·7
Calcutta	105·3	15	69·6	26	100·0	76·0	71·1	63	159·5	43·3	·66	3	2·3
Bombay	89·5	17	73·7	9	86·0	75·5	71·6	74	144·3	64·0	·00	0	1·1
Ceylon, Colombo	92·4	26	71·8	1	89·9	75·2	71·5	70	145·0	59·5	3·60	11	3·4
Melbourne	83·6	4	40·0	30	66·4	49·4	48·4	74	137·0	32·1	2·52	9	5·8
Adelaide	85·2	10	46·2	29	72·3	53·8	47·3	55	143·1	34·9	·97	8	4·0
Wellington	68·0	1	40·0	24	61·7	48·6	...	...	130·0	36·0	2·76	11	...
Auckland	70·0	8*a*	48·0	24*b*	65·8	53·2	49·8	71	140·0	38·0	·54	12	4·6
Jamaica, Kingston	...	...	...	...	...	...	...	...	...	...	...	...	...
Barbados	83·0	25	68·0	7*c*	80·0	71·0	70·2	75	144·0	...	·85	8	5·0
Toronto	67·3	23	17·8	9	45·7	28·8	30·6	73	120·0	7·5	3·05	11	...
New Brunswick, Fredericton	76·8	24	13·7	11	48·9	27·7	27·0	65	...	...	2·69	9	4·4
Manitoba, Winnipeg	66·0	28	−9·0	2	45·6	25·4	30·0	77	...	...	1·82	11	6·5
British Columbia, Victoria	70·0	11	30·0	18	57·8	37·0	...	...	...	...	·53	5	...

a And 20. *b* And 25. *c* And 8, 9, 13.

Remarks, April, 1885.

Malta.—Mean temp., 59°·5; mean hourly velocity of wind, 10·5 miles; sea temp. rose from 61° to 64°; TS on 11th, L on 3rd, 4th, and 17th. J. Scoles.

Cape of Good Hope.—Max. temp. 0°·7 above average; min. temp. 1°·4 below average. W. Ellerton Fry.

Mauritius.—Rainfall 4·10 in. below average; mean temp. equal to average; prevailing wind S.E. to E. by S.; mean hourly velocity 2·3 miles below average, extremes 22·5 miles on 30th, and 1·6 miles on 28th. T on three days, L on 5. C. Meldrum, F.R.S.

Colombo.—TSS on 6 days, and L on 7 other days. J. H. Symonds.

Melbourne.—Rainfall ·30 in., pressure ·128 in., and humidity 1 above the average; mean temp. of air 1°·5, and of dew point 1°·1, and amount of cloud 0·1 below average; prevailing winds S.W. and S., strong on 3 days; heavy dew on 12 days, dense fog on 4. R. L. J. Ellery, F.R.S.

Adelaide.—Mean temp. (63°·0) 1°·4 below average; mean pressure ·102 in. above average, and the highest during 28 years. The weather of the latter half of the month was delightful, the temp. not exceeding 80°, the sky being unusually free from cloud, and the atmosphere pleasantly humid. W. E. Cooke.

Wellington.—From 1st to 17th fine, bright, and pleasant, with moderate winds from N.E. and S.E.; from 17th to 20th wet and stormy from S.E.; thence to 28th generally fine, bright, and cold; last two days wet. Mean temp. (55°·1) 2°, and rainfall ·85 in. below average. R. B. Gore.

Auckland.—A fine month with rainfall less than one-seventh of the average of 18 years; pressure above the average, mean temp. considerably below it. T. F. Cheeseman.

Barbados.—Rainfall 65 per cent. below the average; mean temp. (75°) average; wind N.E. on 28 days, mean hourly velocity 14·2 miles, extremes 18·3 miles and 8·1 miles; the whole month was cloudless; severe drought after the 16th. R. Bowie Walcott.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	4·11	XI.	Rhayader, Nantgwillt..	10·05
,,	Margate, Birchington...	4·30	,,	Carno, Tybrith	8·01
,,	Littlehampton	3·70	,,	Corwen, Rhug	6·60
,,	Hailsham	4·84	,,	Port Madoc	6·27
,,	I. of W., St. Lawrence.	3·73	,,	I. of Man, Douglas	4·62
,,	Alton, Ashdell.....	4·27	XII.	Stoneykirk, Ardwell Ho.	2·31
III.	Winslow, Addington ...	3·86	,,	Melrose, Abbey Gate ...	3·42
,,	Oxford, Magdalen Col...	3·89	XIII.	N. Esk Res. [Penicuick]	2·50
,,	Northampton	3·41	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	4·28	,,	Glasgow, Queen's Park.	2·79
,,	Wisbech, Bank House..	4·88	XV.	Islay, Gruinart School..	3·58
IV.	Southend	3·45	XVI.	St. Andrews, Newton Bk	...
,,	Harlow, Sheering	3·82	,,	Balquhidder, Stronvar..	5 95
,,	Rendlesham Hall	5·04	,,	Dunkeld, Inver Braan..	2·40
,,	Diss	4·86	,,	Dalnaspidal H.R.S. ...	5·24
,,	Swaffham	5·57	XVII.	Keith H.R.S.	3·54
V.	Salisbury, Alderbury...	3·71	,,	Forres H.R.S.	2·13
,,	Warminster	3·96	XVIII.	Strome Ferry H.R.S....	6·72
,,	Calne, Compton Bassett	4·31	,,	Lochbroom	7·71
,,	Ashburton, Holne Vic..	9·70	,,	Tain, Springfield.....	1·92
,,	Holsworthy, Clawton...	7·00	,,	Loch Shiel, Glenaladale	9·96
,,	Hatherleigh, Winsford.	8·28	,,	Invergarry	5·97
,,	Lynmouth, Glenthorne.	5·68	XIX.	Lairg H.R.S.	4·67
,,	Probus, Lamellyn	8·69	,,	Forsinard H.R.S.	4·15
,,	Wincanton, Stowell Rec.	4·53	,,	Watten H.R.S.	3·29
,,	Wells, Westbury.....	5·74	XX.	Dunmanway, Coolkelure	4·69
VI.	Bristol, Clifton	4·53	,,	Fermoy, Gas Works ...	2·52
,,	Ross	2·75	,,	Tralee, Castlemorris ...	4·41
,,	Wem, Sansaw Hall.....	5·04	,,	Tipperary, Henry Street	4·68
,,	Cheadle, The Heath Ho.	6·05	,,	Newcastle West	5·74
,,	Worcester, Diglis Lock	3·51	,,	Miltown Malbay.....	3·97
,,	Coventry, Coundon	4·32	,,	Corofin	...
VII.	Melton, Coston	6·34	XXI.	Carlow, Browne's Hill..	2·95
,,	Ketton Hall [Stamford]	5·42	,,	Navan, Balrath	4·03
,,	Horncastle, Bucknall ...	4·95	,,	Mullingar, Belvedere ...	2·88
,,	Mansfield, St. John's St	6·64	,,	Athlone, Twyford	3·77
VIII.	Macclesfield, The Park.	...	XXII.	Galway, Queen's Col....	4·95
,,	Walton-on-the-Hill.....	6·62	,,	Clifden, Kylemore	6·16
,,	Lancaster, South Road.	3·59	,,	Crossmolina, Enniscoe..	6·05
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	3·69
IX.	Wakefield, Stanley Vic.	3·15	XXIII.	Dowra	...
,,	Ripon, Mickley	5·37	,,	Rockcorry.....	3·47
,,	Scarborough.....	4·86	,,	Warrenpoint	3·20
,,	East Layton [Darlington]	5·45	,,	Newtownards	2·40
,,	Middleton, Mickleton ..	4·60	,,	Belfast, New Barnsley .	4·53
X.	Haltwhistle, Unthank..	3·77	,,	Cushendun	5·08
,,	Shap, Copy Hill	6·13	,,	Bushmills	3·55
XI.	Llanfrechfa Grange	4·49	,,	Stewartstown	3·18
,,	Llandovery	5·96	,,	Buncrana	4·95
,,	Castle Malgwyn	5·33			

OCTOBER, 1885.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
		inches	inches.	in.								
I.	London (Camden Square) ...	3·73	+ 1·03	·98	23	17	60·9	3	33·4	12	0	5
II.	Maidstone (Hunton Court)...	3·76	+ 1·30	1·24	23	18	...	...	...	...	...	...
,,	Strathfield Turgiss	3·70	+ ·96	·77	23	17	...	...	...	...	...	...
III.	Hitchin	4·99	+ 2·81	·87	23	18	56·0	2	30·0	29	2	...
,,	Banbury	3·67	+ ·91	·65	30	22	58·0	3*a*	30·0	30	2	...
IV.	Bury St. Edmunds (Culford)	4·76	+ 2·59	1·02	6	24	62·0	1	29·0	11*e*	5	...
,,	Norwich (Cossey)	6·86	+ 4·53	1·22	13	25	61·0	16	30·5	30	1	10
V.	Weymouth(LangtonHerring)	3·99	...	·63	21	21	...	...	...	...	...	...
,,	Barnstaple.....	5·68	+ ·23	·73	30	23	60·0	19	39·0	25	0	...
,,	Bodmin	7·56	+ 1·29	·72	30	28	55·0	2*b*	37·0	13	0	1
VI.	Stroud (Upfield)	2·95	— ·06	·49	23	18	60·0	4	32·0	11	1	...
,,	ChurchStretton(Woolstaston)	5·62	+ 1·02	1·20	6	26	57·5	25	34·0	12	0	3
,,	Tenbury (Orleton)	4·04	+ ·80	·96	23	23	59·0	16	27·3	12	5	7
VII.	Leicester	5·44	...	1·25	23	23	63·8	16	30·2	30	2	14
,,	Boston	4·89	+ 2·86	1·54	23	23	57·0	16	33·0	12	0	...
,,	Grimsby (Killingholme).....	6·42	+ 3·77	2·11	23	28	57·0	2	35·0	12*f*	0	...
,,	Hesley Hall [Tickhill].....	4·55	...	1·26	23	23	59·0	4	30·0	30	2	...
VIII.	Manchester (Ardwick).....	5·52	+ 1·09	·75	30	24	58·0	2	32·0	12	1	...
IX.	Wetherby (Ribston Hall) ...	4·82	+ 1·46	·99	24	15	...	...	...	...	...	...
,,	Skipton (Arncliffe)	7·47	+ ·21	1·11	4	25	53·0	17	31·0	29	.	...
X.	North Shields	4·56	+ 2·05	·62	10	22	62·5	1	33·0	21*g*	0	2
,,	Borrowdale (Seathwaite).....	12·79	— 3·76	2·10	25	23	55·9	15	27·9	12	1	...
XI.	Cardiff (Ely).....	6·15	+ ·92	1·13	9	19	...	...	...	...	...	...
,,	Haverfordwest	7·42	+ ·97	1·20	21	20	58·0	1*c*	30·0	17*h*	2	2
,,	Plinlimmon (Cwmsymlog) ...	6·90	...	1·47	6	21	...	...	...	...	..	...
,,	Llandudno.....	4·65	+ ·06	·89	6	20	58·1	2	36·0	12	0	...
XII.	Cargen [Dumfries]	4·44	— 1·27	·74	4	16	55·0	2*d*	26·0	25	4	...
,,	Jedburgh (Sunnyside).....	2·27	— ·40	·44	4	23	57·0	2	29·0	13*i*	6	...
XIV.	Douglas Castle (Newmains)	3·80	— 1·14	·95	4	16	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory).....	5·58	— 2·74	·90	4, 25	17	...	...	...	..	...	...
,,	Oban (Craigvarren)	4·06	...	·60	25	18	58·5	15*k*	31·0	22	3	...
,,	Mull (Quinish).....	5·13	...	1·02	25	21	...	...	...	...	...	...
XVI.	Loch Leven Sluices	1·70	— 2·61	·50	31	8	...	...	...	...	...	...
,,	Arbroath	1·52	— 1·35	·46	30	11	55·0	1, 5	29·0	25	4	...
XVII.	Braemar	3·26	— 1·22	·57	12	24	53·0	2	17·0	25	11	20
,,	Aberdeen	2·21	...	·50	25	20	56·0	1, 2	26·0	22	5	...
XVIII	Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,	Culloden	1·58	— ·71	...	...	...	56·0	2	22·0	23	8	15
XIX.	Dunrobin	3·37	...	·57	25	18	56·0	2	28·0	25	5	...
,,	Orkney (Sandwick)..... ..	4·67	+ ·38	·90	2	23	...	...	...	...	...	...
XX.	Cork (Blackrock)	2·74	— 2·00	·66	29	23	60·0	3, 6	33·0	24	0	...
,,	Dromore Castle	6·99	...	·99	25	21	65·0	25	31·0	22	...	...
,,	Waterford (Brook Lodge) ...	4·43	...	·63	29	17	58·0	8	33·0	23	0	9
,,	Killaloe	4·50	...	·56	20	22	58·0	8	32·0	22*g*	2	...
XXI.	Portarlington	2·92	— ·55	·51	5	23	56·0	3	34·0	24	0	...
,,	Dublin (FitzWilliam Square)	3·50	+ ·08	·99	6	22	57·1	2	33·2	25	0	9
XXII.	Ballinasloe	3·63	— ·80	·66	6	18	52·0	17	30·0	22*g*	4	...
XXIII	Waringstown	3·22	— ·39	·42	25	22	60·0	1	26·0	24	3	10
,,	Londonderry (Creggan Res.).	4·95	...	·80	4	27	...	...	...	...	...	...
,,	Omagh (Edenfel)	3·45	— ·87	·48	25	20	55·0	17	31·0	24	2	4

ENGLAND. WALES. SCOTLAND. IRELAND.

a And 4, 16. *b* And 3, 5, 6. *c* And 2, 4, 6. *d* And 3, 7, 15. *e* And 29. *f* And 28.
g And 25. *h* And 24. *i* And 25, 30. *k* And 24.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON OCTOBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The heavy rains at the beginning and close of the month stopped the sowing of wheat, which was but irregularly done all through the month.

HITCHEN.—Since July, which had an average temperature, we have had the coldest August, the coldest but two September, and the coldest but one October since the record commenced in 1849.

BANBURY.—Mean temp. (44°·8) 4°·5 below the average; fog on 5 days, high wind on 5 days, H on 27th.

CULFORD.—A most uncomfortable month, with continuous drenching rains which delayed the storing of the mangold crop and all out-door work.

COSSEY.—A very cold and wet month.

LANGTON HERRING.—Rainfall ·42 in. above the average of ten years; mean temp. three degrees below the average, and with the exception of 1880 and 1881 the lowest in October during 14 years; the max. temp. was also the lowest in that period. The 9th and 10th were very stormy, the lowest pressure recorded this year occurring on 10th.

BODMIN.—Mean temp. 48°·0.

STROUD.—A very wet and cold October; dense fog on morning of 17th.

WOOLSTASTON.—A cold, stormy month with constant R; mean temp. 43°·8.

ORLETON.—A very cold and rainy month with a few fine days; mean temp. more than 4° below the average of 25 years, and lower than that of any October in that period except 1880; there were several frosty mornings but not severe, and the temp. was uniformly low; fluctuations in pressure were rapid and frequent, wind frequently very strong, especially on 27th; dense fog on morning of 17th; L on 27th and 28th.

LEICESTER.—The month was a very wet one with some very cold nights, the min. on grass twice falling to 22°.

KILLINGHOLME.—A month of almost incessant R, the fall of the 23rd being the heaviest ever recorded here, and the total for the month having been approached only by that of December, 1867, when 6·22 in. fell on 29 days.

MANCHESTER.—A wet month, the R being both heavy and constant; occasional frosts at night, and two or three foggy mornings; T on 5th, severe T and H on 27th.

WALES.

HAVERFORDWEST.—The first half of the month was but a continuance of the excessive wet of the previous one, accompanied frequently at night by H, T, and L; from 15th to 20th fine weather prevailed with slight frosts; a stormy, wet period again set in on 21st, continuing, with a slight break of three days, to the end. Although it blew very strongly at times from N.W. and N.N.E., there were no violent gales. Mean temp. about the average; scarcely any frost.

SCOTLAND.

CARGEN.—The beginning and end of the month were very stormy and wet, and it was the coldest October for many years; mean temp. (44°·0) 4°·4 below the average.

JEDBURGH.—The month was distinguished by the number of days on which R fell, and the prevalence of cold N. and N.E. winds. The weather was cold and ungenial, and owing to the frost and wet, deciduous trees were quite bare at the close; root crops still improving; cereals all secured in good order.

OBAN.—Rainfall moderate, and temp. low, but the weather was seasonable, and the potatoe crop both plentiful and well saved.

QUINISH.—Wet and stormy from 1st to 8th, and from 25th to 30th; sharp frost from 21st to 24th, which broke up on 25th, with very heavy R from S.E. A very bad harvest was finished in this district about the middle of the month, very little grain being left in the sheaves, but the straw in fair order.

BRAEMAR.—A very unsettled month, cold and wet, and the hills covered with fresh S; grass temp. on 25th as low as 9°.

ABERDEEN.—Rainfall of the month about three quarters of an inch below the average; otherwise nothing remarkable to record. Lunar halo on 22nd; H on two days.

CULLODEN.—The weather during the month was unsettled, but there were considerable intervals of dry and favourable harvest weather, which allowed the crops to be safely gathered, except in the Highlands, where they suffered greatly from frost; potatoes free from blight, and an average yield.

IRELAND.

DROMORE.—The beginning of the month was wild and cold, with N.E. winds; the latter part was mild with N.W. winds.

WATERFORD.—A very wet and wild month. S on Mount Leinster on 11th; thick fog on 18th and 19th

KILLALOE.—The general character of the month was normal, and the rainfall was about the average; winds moderate; mean temp., 46°·1, rather lower than usual.

DUBLIN.—A very cold, unsettled, and rainy month, polar winds predominating largely; H showers frequent. Mean temp. (44°·6) 4°·6 below the average, and nearly as low as that of October, 1880 (44°·5), which was the coldest October in 20 years. L on 12th; T on 23rd; lunar halo on 20th; fog on five days. Mean humidity, 88; prevailing winds, N.W.

EDENFEL.—The cold, wet, and unsettled weather which commenced on September 1st did not terminate till October 14th, during which time there were but three rainless days. A fine, calm, and mostly clear period of 11 days, however, followed, enabling what remained of the cereals to be rescued, and the heaviest and soundest crop of potatoes since 1846 to be dug and stored in excellent order. From 25th to 31st the weather was again wet and squally.

PRE-INSTRUMENTAL METEOROLOGY.

WE have never swerved from the opinion expressed many years since in this magazine that considerable service would be rendered to meteorology by the collection of old weather records. We are glad to find evidence that our neighbours in France are of the same opinion. The last number of the *Annuaire de la Soc. Mét. de France*, contains a copy of such records from 1584 to 1781, extracted from the records of the church of Notre Dame de Tonnerre (Yonne), about 100 miles S.E. of Paris. We should be very glad to receive and publish analogous excerpts from British Parish registers.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCXXXIX.] DECEMBER, 1885. [PRICE FOURPENCE, *or 5s. per ann. post free.*

METEOROLOGICAL BIBLIOGRAPHY.

WE think that it will be of general interest to state what progress has been made by the United States Signal Office with the preparation of the catalogue of books and papers upon Meteorology.

The articles upon the subject which have appeared in this Magazine* have described Mr. Symons's share in the work, and render it unnecessary to do more than give the references to them for the use of any one who desires to refer to the early history of the subject.

With the permission of General Hazen we proceed to explain the progress which has subsequently been made at the Signal Office, and through his influence.

First and most important of all, Dr. Hellmann has consented to the incorporation of all the works (about 5,200) quoted in his splendid *Repertorium*.

Dr. Hann is preparing a catalogue of the library of the central Anstalt at Vienna.

Prof. Wild forwarded a catalogue of 280, and Prof. Woeikof one of 310, contributions to meteorology.

Dr. Mohn has furnished a similar list for Norway.

A valuable collection of 196 titles has been received from the Royal Library, Copenhagen.

Polish literature will be represented by titles extracted from Zebrawski's *Bibliografia*, Krakau, 1873, completed by titles furnished by Dr. Karlinski.

Senor Merino, of the Madrid Observatory, has kindly undertaken to collect Spanish material.

Dr. J. C. de Brito Capello, of the Lisbon Observatory, has rendered important help.

Dr. Neumayer has furnished a catalogue of the library of the Deutsche-Seewarte, including the important library of Prof. Dove.

Mr. Ellery forwarded a complete bibliography of Victorian Meteorological publications.

Mr. C. Amnerstedt, Librarian of the Upsala University Library,

* Vol. XVII. (1882), p. 1 and 129; Vol. XVIII. (1883), p. 97 and 135.

sent 337 Swedish titles of dates earlier than those published by Fineman.

In completion of the Royal Society Catalogue, the most important periodicals have been indexed from 1874, and 5,000 new titles have already been obtained from this source. Reuss's *Repertorium Commentationum* (about 2,500 titles) has been copied; also Poggendorff's *Handwörterbuch* (about 1,000), Dähuert's *Greifswald Catalogue*, the Royal Society *General Science Catalogue*, Zuchold's *Bibliotheca-Naturalis*, May's *Bibliography of Electricity*, and many others.

The total number of titles now in the office is about 48,000, and although these doubtless contain some duplicates, it must, on the other hand, be recollected that as the catalogue is to be a *subject* ca ogue, many books must be entered twice.

When it is remembered that the Catalogue of the Library of the Royal Meteorological Society (1876) contained only 1,214 entries, one gets an approximate idea of what a great work the Washington Catalogue will be with about forty times that number.

We understand that although the collecting is almost finished, and the classification has been commenced, there is still time for the reception of additional material if any of our readers have fresh titles to send, because Congress has not yet voted the funds for publication. We, however, refuse to believe for a moment that Congress will in this respect depart from the generous views which it has always held respecting the diffusion of useful knowledge.

THE BIELA METEORS.

ON or about November the 18th, the following circular was issued from Lord Crawford's Observatory, Dun Echt, Aberdeenshire:—

"Considering the great uncertainty which envelopes the fate of Biela's comet, it seems desirable to call to mind that about midnight on the 27th inst. the earth will be in the path of the meteors seen to radiate from near γ Andromedæ on November 22, 1872. The comet's periodic time, and presumably that of the meteors, being about 6·6 years, nearly two periods will have elapsed since the meteoric shower of 1872. If, therefore, the meteors are very widely distributed along the comet's orbit, there is a chance that they may again appear in considerable numbers this year. In 1892, and still more in 1905, there is a probability of a return of the display of 1872."

As regards the complete fulfilment of this anticipation, we print *in extenso* two notes with which we have been favoured, and at the end of them an epitome of such other information as has come to hand.

To the Editor of the Meteorological Magazine.

SIR,—The display to which attention was drawn by circular from Dun Echt took place on the 27th, but earlier in the evening than was anticipated. It commenced soon after dusk and lasted till 9 p.m., when clouds and rain prevented further observations. Ten time

records were taken at intervals at Guildown, and three other local ones have been communicated to me. At times the stars fell almost continuously, and occasionally three or four at a time. As the result of actual countings of portions of the sky, the estimated general rate for all parts was found to be as follows :—

6	P.M.,	10	per minute.
7.20	,,	22	,,
7.50	,,	29	,,
8.30	,,	25	,,
9.0	,,	26	,,

A few of the observations when the shower was thickest gave 40 to 50 per minute.

Except for a short interval about 7.30, there was always cloud and mist to some degree, so that the countings and estimates are possibly under the mark. The estimated proportion of large meteors was 1 in 10. These were white with long yellow or reddish-yellow trails, and 3 to 4 times the size and brightness of Jupiter. The intermediate ones in size also were white. The smaller stars often appeared of a bluish and some of a yellow or yellow-red tint. A considerable proportion of the meteors were referred to the radiant point, but frequently they were scattered all over the sky, and not so easily traced. At intervals they seemed more numerous in particular quarters, notably E. and W., and two observers towards different points would differ considerably in their countings. The numbers observed overhead did not seem larger than elsewhere. At 9 p.m. on the 28th three large ones were observed.

J. RAND CAPRON.

Guildown, Nov 28, 1885.

To the Editor of the Meteorological Magazine.

SIR,—Last evening (November 27th) a grand display of meteors occurred here. The sky at the time had some light clouds towards the south, but these shortly cleared away, leaving it intensely clear.

At 5.45 (5.1 p.m. G.M.T.) it became suddenly alive, with meteors falling to all points of the horizon from the small star γ Andromedæ; their motion was slow, giving one the idea of flakes of snow falling in a calm. Some were very minute, barely visible; others as large as Jupiter or Venus. The latter travelled rapidly, leaving luminous red streaks in their path, lasting in some cases more than half a minute—long enough to determine their direction to the above-named star. Great numbers, and these of considerable size, but slow motion, came into view within a degree or two only of the horizon.

At 7.30 (= 6.46 p.m. G.M.T.) they diminished gradually in number. Sky clouded from 8 to 9.30 (= 7.16 to 8.46 p.m. G.M.T.), but the meteors were seen in the intervals between the clouds.

At 9.30 (= 8.46 p.m. G.M.T.) the sky was again cloudless; meteors were still falling, though less in number, on all sides.

At midnight there were only occasional ones, and these chiefly in the west.

At first, counting was quite impossible, but at 6.25 (=5.41 p.m. G.M.T.) I was able to count 104 between the N. and N.W. points in one minute; my daughter counting 60 in the opposite quarter, and another counting 39 from the radiating point in the same time.

At 10 p.m. (=9.16 p.m. G.M.T.) I counted from the radiating point 20; at 11 p.m. (=10.16 p.m. G.M.T.) 7; and at midnight (=11.16 p.m. G.M.T.) 2 meteors.

I have seen nothing like it since the shower of 1866.

Faithfully yours,

MICHAEL FOSTER WARD.

Partenkirchen, Bavaria, Nov. 28, 1885.

We have from Bavaria (12° E.) to Bristol (3° W.), and from Tunis (38° N.) to Inverary (56° N.), notes of the shower, but the prevalence of cloud renders it very difficult to determine the epoch of maximum number, and the rate of increase and decrease towards that maximum. It is quite certain that by 9 p.m. local time the numbers were decreasing everywhere. It is almost equally certain that the numbers were increasing from 5 p.m. to 6 p.m. local time. In a very interesting note in *Ciel et Terre*, the time of maximum is given for Brussels as 6 p.m. local time (5h. 43m. G.M.T.); but at Liége, within a few miles of Brussels, they are said to have been falling at the rate of 1,800 an hour at 8 p.m. local time (7h. 45m. p.m. G.M.T.) At Clermont (in Central France) the shower lasted from 6 till 9 p.m., and at 7 p.m. local (7h. 6m. G.M.T.) meteors were falling at the rate of 3,000 an hour.

In England, the observations were much interrupted by cloud, but one of the best observers (Mr. Denning, of Bristol,) found the number increase gradually from 5 till 6.35 p.m., when clouds prevented further observations. It may, therefore, be taken as certain, that at Bristol the max. did not occur before 6.30 p.m. The only report which we have yet seen from Greenwich implies a decrease from 6 p.m. onwards, but possibly full details may modify this. We think that the absolute maximum occurred at about 6.30 p.m. local time, and a very important secondary maximum between 8 and 8.10 p.m. local time.

As regards the maximum number, there is also great discordance, but three good records agree closely. M. Thirion, of Louvain, in *Ciel et Terre*, gives 193 per minute as the maximum (at 6.48 p.m. local time), counted by two observers standing back to back, *i.e.*, a total of nearly 12,000 an hour. Mr. Denning gives 5,000 an hour for *one* observer, or 10,000 an hour for two; and Col. Ward's figures also work out to about 12,000. Most records are, however, much below this, and, indeed, we are rather puzzled to know how this rapid counting is done, except where, as at our own station, a recording chronograph is available, for 5,000 an hour for one observer implies an average of $1\frac{1}{2}$ in each second, and as they do not fall uniformly, it may be said to be somewhat nearer three in one second and none in the next.

In magnitude and in their tails they were far inferior to the Leonid's of November, 1866. Very few were equal to or greater

than a first magnitude star, and not one tail remained long enough for a telescope to be turned on to it; whereas, in 1866, most of them were brighter than Sirius, and the tails were visible for minutes instead of seconds—several for 10 minutes and one for 14 minutes.

P.S. Our American contemporary, *Science*, of December 4th, reports that at George Town, D.C., Lat. 38° 55′ N., Lon. 77° 0′ W., a considerable shower was seen between 6.30 and 7.50 p.m. on 27th, [= 11.38 p.m. and 0.58 a.m. on 28th G.M.T], and four observers counted as follows:—

						a.m. 28th.					
100	between	7.0 & 7.30	=	100	between	0.8 & 0.38	G.M.T.	=	200	per	hour.
100	,,	7.30 & 7.55	=	100	,,	0.38 & 1.3	,,	=	240	,,	
100	,,	7.55 & 8.38	=	100	,,	1.3 & 1.46	,,	=	140	,,	
28	,,	8.38 & 9.0	=	100	,,	1.46 & 2.8	,,	=	76	,,	

ROYAL METEOROLOGICAL SOCIETY.

The Opening Meeting of the Session was held on Wednesday evening, the 18th November, at the Institution of Civil Engineers, 25, Great George Street, Mr. R. H. Scott, F.R.S., President, in the chair.

Messrs. F. R. H. Clunn, R. S. Davies, B.A., H. C. Fox, M.R.C.S., W. E. Jackson, J. Richardson, M.Inst.C.E., F.G.S., A. L. Rotch, and C. Todd, C.M.G., were elected fellows of the Society.

The following papers were read:—

(1). "The Helm Wind of August 19th, 1885," by William Marriott, F.R.Met.Soc. This wind is peculiar to the Cross Fell range, Cumberland, and is quite local but very destructive. The chief features of the phenomenon are the following:—On certain occasions when the wind is from some easterly point the Helm suddenly commences. At first a heavy bank of cloud rests along the Cross Fell range—at times reaching some distance down the western slopes, and at others hovering about the summit—then at a distance of one or two miles from the foot of the Fell there appears a roll of cloud suspended in mid-air and parallel with the Helm Cloud; this is the Helm Bar. A cold wind rushes down the sides of the Fell and blows violently till it reaches a spot nearly underneath the Helm Bar, where it suddenly ceases. The space between the Helm Cloud and the Bar is usually quite clear, blue sky being visible: at times, however, small portions of thin vaporous clouds are seen travelling from the Helm Cloud to the Bar. The bar does not appear to extend further west than the river Eden. The author visited the district in August last, and was fortunate enough to witness a slight Helm. He gave a detailed account of what he experienced, and also observations on the temperature of the air at the summit and base of Cross Fell, the direction and force of the wind, the movement of the clouds, &c.

(2). "The Typhoon origin of the Weather over the British Isles during the second half of October, 1882," by Henry Harries. The

author shows by means of daily charts, that a Typhoon which originated near the Phillipine Islands on September 27th, 1882, passed over Japan and the Aleutian Archipelago, entering the United States on October 10th. Crossing the Rocky Mountain range it proceeded through the Northern States and Canada to Labrador and Davis Strait. In the Atlantic it was joined on Oct. 18th by another disturbance which had come up from the Atlantic Tropics, the junction of the two being followed by a cessation of progressive movement from the 19th to the 25th. During this period the severe gale which passed along our southern counties on the morning of the 24th was formed, its sudden arrival upsetting the Meteorological Office forecasts of the previous night. Observations are quoted, showing that it would have been impossible for the Department to have been aware of its existence before about 3 a.m. of the 24th. Following in the wake of this storm the parent cyclone reached the French coast on the 27th, its advent being marked as in Japan and America by violent gales and extensive floods over the whole of Western and Central Europe and Algeria. The village of Grindelwald was destroyed, and in the Austrian Tyrol the damage caused by floods reached at least two millions sterling. Passing through France and the Netherlands the disturbance showed signs of exhaustion, and on November 1st in the Baltic it quietly dispersed, after accomplishing a journey of more than 16,000 miles in 36 days. This is the first storm which has been followed day by day from the Pacific to Europe.

(3). "Notes as to the principle and working of Jordan's Photographic Sunshine Recorder," by J. B. Jordan and F. Gaster, F.R.Met.Soc. This instrument consists of a cylindrical dark chamber, on the inside of which is placed a prepared slip of photographic paper. The direct ray of sunlight being admitted into this chamber by small apertures in the side, is received on the sensitized paper, and, travelling over it by reason of the earth's rotation, leaves a distinct trace of chemical action whenever the light is of sufficient intensity to show a definite shadow on a sun-dial. The cylinder is mounted on a stand with adjustments for latitude, &c. The record is fixed by simply immersing it in water for a few minutes. As the instrument records the actinic or chemical rays, it usually shows a longer duration of sunshine than is obtained by the ordinary "burning" sunshine recorder, the latter recording only *bright* sunshine.

[An engraving of the first pattern of this instrument will be found on p. 38 of this volume. We think that the records of this instrument should be called sun*light*, to distinguish them from those of the burning sun*shine* instrument.—ED.]

REVIEWS.

Principles of Forecasting by means of Weather Charts. By the Hon. RALPH ABERCROMBY. Issued by the authority of the Meteoro logical Council. 8vo., viii.-124 pages. London: Stanford, 1885.

BY the clearness with which he writes, and by the avoidance of technicalities and those crooked words which deter the ordinary public from following the science of the present day, Mr. Abercromby shows himself perfectly at home in the whole subject of Meteorological Chartography and weather prediction. Any one of ordinary intelligence can follow him through the whole work, and gain a clear and common sense view of the principles of weather forecasting, and to an intelligent reader the interest is greatly enhanced by the way in which it calls up in the mind many popular prognostics, and shows that they are not only true, but the practical expression of that which this work exhibits theoretically.

He has given the clearest definitions we have yet seen of anticyclones, cyclones and other depressions, and by so doing has rendered a considerable service, which we trust that future writers will utilize by rigorously following, and thus avoid the somewhat loose employment of identical terms for different conditions.

The work, which is fully illustrated, begins by describing synoptic Charts as the basis of weather forecasting, and among their data gives the Beaufort Scale, with the equivalent velocities of wind adopted by the Meteorological Office. This scale though undoubtedly very accurate in the days of sailing ships, and probably still sufficiently so at sea, gives a very rough estimate on shore, and the equivalent velocities are perhaps the most imaginary values that remain in modern Meteorology. The next chapter explains gradients, isobars and the direction of wind in relation to isobars, cyclones and typical areas of low pressure and anticyclones and typical areas of high pressure with their general accompanying weather, and it is impressed on the reader that the wind and weather depend on the shape and intensity (*i.e.*, the steepness of the gradients) of a cyclone, and not on the level of the isobars, or, in other words, on the relative and not on the absolute pressures. Having in these chapters clearly described as it were plans of the weather for given instants of time, the author proceeds with weather sequence, describing the main features of the great areas of pressure on whose arrangement the persistence of our types of weather depends. The types are described under the headings Southerly, Westerly, Northerly and Easterly, but that they are sufficiently connected with the cardinal points of the compass to justify the nomenclature, we are not fully convinced.

We are told in the preface that the Author was by illness prevented revising the proofs, and are therefore loth to criticize, but on p. 49, a misprint of Ireland for Iceland renders the meaning somewhat obscure, and the chart and descripton thereof on p. 60 do

not tally, reference being made to a reading of 31·1 in., which does not appear.

Following the "Types" comes a section on Recurrence, a few sentences of which we extract :—

"By 'recurrence' of type is meant the tendency of certain kinds of weather to recur about the same season of every year."

"January 14th to 20th, a great barometric surge. February 7th to 10th, a spell of cold weather associated with the Northerly type. This is the first of a series of six cold and three hot periods observed by Mr. A. Buchan, and described by him.* The method adopted by him was to note the irregular flexures in the general sweep of the annual temperature curve. He found their recurrence so regular that he says, 'During the last 50 years some of them appeared every 'year between the dates specified, and none failed to make their 'appearance on more than five years.'"

"April 11th to 14th, a cold spell. Buchan's second period, which he has identified with the popular 'weather saw' of the 'borrowing days.' These are three cold days which March is said to borrow from April, allowing for the difference of the old and new style of reckoning the calendar

"May 9th to 14th, a cold spell. Buchan's third period. This is the most celebrated of the cold periods, as it occurs over all Europe, and has been the subject of many wild theories. The saints to whom these days are dedicated in the German calendar have been popularly called 'the Frost Saints.' This cold spell is also known as 'Maedler's cold days,' from the name of an investigator."†

"July 12th to 15th, a warm period; Buchan's first. July 15th, St. Swithin. The popular legend of this saint, and other rainy saints like St. Méchard [? Médard], receives an easy explanation from synoptic charts. Roughly speaking, the weather at the end of July is influenced by one of two types; either the Westerly of considerable intensity, which would be rainy, or the Northerly type, which would be dry. If, then, there is either a rainy or a dry spell about the 15th, similar weather may be expected to last for some time after, if not for 40 days.

"August 2nd to 8th, a wet period; the 'Lammas floods' of Scotland. 6th to 11th, a cold period; Buchan's fifth. 12th to 15th, a hot period; Buchan's second."

The first 70 pages of the book having dealt with the *materials* for forecasting, the last 50 pages are devoted to forecasting, including storm warnings. With reference to warnings telegraphed from America, the author ventures to sum up as follows :—

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* Journal of the Scottish Meteorological Society, Vol. II. (new series), pp. 4, 41 and 107.

† For some interesting details, see W. von Bezold. "Die Kälte-rückfälle, n Mai." Abhand. K. Bayer. Akademie der Wiss., II. Cl. XIV. Bd. II. Abth.

"From all these considerations the conclusion is inevitable, that though there is an undoubted connexion between the weather on both sides of the Atlantic, the nature of the changes are so complicated and variable, that no practical use can be made of the knowledge for forecasting purposes without observations over the intervening ocean."

The section on sunspots and weather is perhaps useful in a work that is intended to be popular, though the author does not demolish the theory of their connection very vigorously; we thought that it had been long ago consigned to the limbo of fallacies.

The section on prognostics shows how useful halos, cirrus cloud, &c., may be in aiding the forecaster, especially when the indications of the synoptic charts are not clear, but recognizes the great difficulty of cirrus observations and enforces their greater value as indications of rain than of wind.

Numerous illustrations of successful and unsuccessful forecasts are given, and the reasons of their success or failure clearly shown, the effect of even a slight deviation of a cyclone from the expected track in vitiating the prediction as to direction and shift of wind is dwelt upon, and the work closes with abstracts from the summary of failures and successes worked out in the Meteorological Office which shows a percentage of complete successes of about 35 per cent., and of partial successes of about 45 per cent.

Anleitung zur Aufstellung von Wetterprognosen auf Grundlage der Zeitungs-Wetterkarten oder der Isobaren-Telegramme. Von DR. J. VAN BEBBER. (Separat-Abdruck aus der von der Deutschen Seewarte herausgegebenen Monatlichen Uebersicht der Witterung, April, 1885).

THIS paper has so much in common with Mr. Abercromby's that we add a few lines in order to call attention to it. The paper has been prepared from the Daily Weather Maps issued by the German Government during the last ten years, as Dr. van Bebber says, not in order that everybody may become his own weather prophet, but to render accessible to all the usual sequences of certain typical distributions of atmospheric pressure.

The author points out that the great difficulty in the way of weather forecasting arises from uncertainty as to the direction in which the cyclonic systems are likely to move, and gives maps and tables illustrative of the facts probable according to the localities of barometric minima, and the weather to be expected in N.W., S. and E. Germany as the result.

Mesures des Hauteurs et des Mouvements des Nuages. Par N. EKHOLM ET K. L. HAGSTROM (*Présenté à la Société Royale des Sciences d'Upsal*). 4to, 64 pages and 1 plate. Upsal: E. Berling, 1885.

M. HILDEBRANDSSON and his staff have long been convinced that the

best mode of determining the heights and motions of clouds is by trigonometrical observations made simultaneously at the extremities of a suitable base line, but the difficulty lay in the identification of the object and in the simultaneous action of the two observers. The first idea was to establish telegraph instruments at each end, but the process would have been costly and slow. When the Swedish Arctic expedition to Spitzbergen was being organized the telephone had been invented, and it was resolved to prepare special theodolites for the observation of aurora borealis, and to provide telephones so that simultaneous observations of auroral phenomena could be taken. After the return of the expedition these instruments were placed at the disposal of Dr. Hildebrandsson, and arrangements were at once made for their application to cloud measurement, Messrs. Ekholm and Hagström undertaking the work. Two brick pillars with the requisite shelter-houses were provided, one at Upsala observatory, the other at about a quarter of a mile further South.

The present work describes first the instruments, then very fully the mode of calculation, and afterwards gives the results of the summer months of 1884. We must give them very briefly.

The mean height of the various forms of cloud is given in the following table.

No. of Observations.	Cloud.	Altitude. Feet.	Miles.
5	Stratus	2050	0·4
24	Lower Nimbus	3658	0·7
12	Upper ,,	7169	1·4
101	Summit of Cumulus and Cumulo Stratus	5545	1·1
51	Base of ditto	4288	0·8
22	Lower Alto-cumulus	6522	1·2
5	Upper ,, ,,	13911	2·7
10	Cirro-cumulus	18078	3·5
64	Cirrus	22346	4·3

The altitudes of the bases of cumuli are nearly constant during the middle of the day, but increase towards evening, but the altitudes of the tops increase rapidly, from a morning minimum, until 1 p.m., when they begin to decrease, but not so fast as they had previously increased.

The bases of nimbi are often within a few hundred feet of the ground, their tops as much as 1,000 ft. above it, and though there are indications that nimbi dissolve from below upwards, the evidence is uncertain.

Cirrus clouds appear to rise throughout the day, the following being the values :—

Time	11.30 a.m.	1.30 p.m.	5 p.m.	6 p.m.
Altitude in miles	3·7	4·1	4·4	4·7
No. of observations	15	10	12	27

The authors investigate many other points, but, as they truly remark, their series of observations was too short to afford conclusive evidence. We are glad to hear that a fresh series was to be commenced with the great advantage of a longer base line than the quarter of a mile hitherto employed.

Lehrbuch der Meteorologie. Im auftrage der direktion der Deutsche Seewarte bearbeitet VON DR. A. SPRUNG. 8vo. xii,—408 pages and 17 plates. Hamburg: Hoffmann und Campe. 1885.

WE were told, not many years since, that meteorology was not a science, and as the statement was made by one who ought to be an authority, we accepted the dictum with the reverence due to the speaker's position; but a certain amount of mischief lurks in the disposition of most persons, and we certainly wish that it were our friend's fate to have to thoroughly master and be examined upon Dr. Sprung's work. We think that we should never again be told that meteorology is not a science.

The work (after an introduction explanatory of the effects of the earth's rotation, &c.), is divided into five sections, and it will give a rough idea of the character of the book if we specify the sections and the number of pages devoted to each:—(A) Statics of the Atmosphere (*53*); (B) Dynamics of the Atmosphere (*191*); (C) Solar Radiation and its periodic effects (*69*); (D) Periodic phenomena independent of either the earth's daily or annual motion (*3*); (E) Investigations into the variability of meteorological elements, independently of their cause (*16*).

The book reminds one of an experienced general who will not advance until each previous position is thoroughly safe, or like a good builder who pays special attention to the foundations, and will not allow the edifice to be advanced till all is perfectly set. Dr. Sprung, by adopting this course, creates in his readers a sentiment of solidity and of reliance which will render his book one which will last—will outlast many others. One result of this is, of course, that the work bristles with formulæ, six or seven on a page; in fact, in the section devoted to the horizontal component of atmospheric motion, there are no fewer than 50 different formulæ. We should, however, leave a false impression if we did not add that mathematical knowledge is by no means indispensable to a reader, and that no one can go through Dr. Sprung's book without having clearer and sounder views on meteorological subjects than he had before. Take, for instance, the following passage respecting the evaporation from a water surface:—

"The evaporation from a freely exposed water surface is therefore favoured by the following circumstances:—(1) High temperature; (2) Small relative humidity of the air resting upon it; (3) Motion of this air, inasmuch as thereby the collection of water molecules in a gaseous form over the liquid is avoided; (4) Small atmospheric pressure, inasmuch as with it the number of the down-pressing molecules decreases."

We are glad to see that so cautious a writer as Dr. Sprung accepts Baron Wrangel's explanation of the Bora of the Black Sea, which we cannot help thinking will afford suggestions useful to the Royal Meteorological Society's Helm Wind Committee.

Dr. Sprung's *Lehrbuch* reflects credit upon himself and upon Dr. Neumayer, Director of the Deutschen Seewarte, by whose authority it was prepared.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	73·8	28	31·1	8	59·7	42·2	41·0	72	119·3	26·9	2·63	19	6·0
Malta	84·3	5	51·1	18	74·3	58·2	55·3	72	138·0	46·0	·00	0	2·6
Cape of Good Hope	74·0	7	34·6	31	64·5	46·3	...	...	...	...	3·73	11	5·2
Mauritius	82·6	5	64·1	27	78·7	69·4	65·3	77	131·7	50·8	7·40	17	5·2
Calcutta	103·7	26	67·2	7	96·4	76·8	74·5	71	164·7	63·0	4·84	10	3·3
Bombay	90·3	30	75·2	2	88·9	79·5	75·4	76	148·9	67·0	·02	1	1·7
Ceylon, Colombo	90·4	18	73·8	8*a*	88·3	76·0	73·5	76	147·0	64·2	9·22	24	6·7
Melbourne	75·0	2	41·2	14	61·6	48·2	46·1	73	125·0	33·0	1·23	14	7·5
Adelaide	80·6	3	42·0	7	67·7	53·7	47·0	61	138·5	38·4	2·24	16	6·7
Wellington	62·0	5	38·0	12	56·8	46·2	48·1	80	116·0	34·0	5·18	24	...
Auckland	65·5	10	40·0	31	61·8	50·6	47·9	73	124·0	30·0	4·64	19	6·7
Jamaica, Kingston	91·5	20	69·1	6	86·2	72·7	72·3	76	...	...	2·72	...	4·8
Barbados	83·0	var.	69·0	3*b*	82·0	72·0	72·5	80	149·0	...	4·32	12	6·0
Toronto	74·1	25	28·1	12	60·6	42·9	43·4	70	134·0	22·4	2·26	14	6·1
New Brunswick, Fredericton	83·2	26	24·9	4	64·9	38·1	39·1	64	...	...	2·90	8	4·3
Manitoba, Winnipeg	80·1	29	19·0	6	62·3	38·0	43·0	62	...	...	1·94	12	5·8
British Columbia, Victoria	75·0	5	36·0	1	...	...	...	...	...	...	1·30	13	...

a And 10. *b* And 19.

REMARKS, MAY, 1885.

MALTA.—Mean temp. 65°·0; mean hourly velocity of wind 8·7 miles, velocity on 5th, 31 miles per hour from 4 to 6 p.m.; sea temp. rose from 64° to 70°. J. SCOLES.

Cape of Good Hope.—Max temp. 0°·5, and min. temp. 4°·6 below average; a strong shock of earthquake at 11·40 p.m. on 10th. W. ELLERTON FRY.

Mauritius.—Rainfall 2·15 in. and mean temp. 0°·3 above average; prevailing wind E. S.E., mean hourly velocity 10·1 miles, extremes 23·9 miles on 1st, and 1·9 miles on 17th; L on 13th, T and L on 14th and 15th, T on 16th. C. MELDRUM, F.R.S.

Colombo.—TSS on 14 days, L on 15 other days. F. C. H. CLARKE, MAJOR R.A.

Melbourne.—Rainfall ·93 in., and humidity 5 below average; mean temp. of air 1°·5, of dew point 0°·1, pressure ·086 in., and amount of cloud 1·0 above average; prevailing winds N., strong on 9 days; heavy dew on 5 days.
R. L. J. ELLERY, F.R.S.

Adelaide.—Rainfall nearly an inch below average; mean temp. (60°·7) 3°·1 above average, and the highest recorded in 28 years; mean pressure (30·187 in.) ·069 in. above average; mean amount of cloud also considerably in excess, especially at 6 and 9 p.m., the means for those hours being the highest on record. W. E. COOKE.

Wellington.—A very wet month almost throughout; cold in the early part, warmer later; prevailing winds N.W. and S.E., frequently stormy and cold. Mean temp. (51°·5) 1°·5 below average; rainfall ·50 in. above average; H on 14 and 15th.
R. B. GORE.

Auckland.—On the whole a showery and unsettled month, with a predominence of S.W. wind. Pressure and rainfall above the average; mean temp. below it; heavy R on 22nd, 1·53 in. T. F. CHEESEMAN.

BARBADOS.—Rainfall 3 per cent. below average; mean temp. (76°) average; prevailing wind N.E., mean hourly velocity 12·5 miles, 13 per cent. above the average, extremes 16·2 miles and 6·2 miles; 3 days partly clouded. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·29	XI.	Rhayader, Nantgwillt..	7·65
,,	Margate, Birchington...	2·04	,,	Carno, Tybrith	5·11
,,	Littlehampton	3·19	,,	Corwen, Rhug	2·90
,,	Hailsham	3·54	,,	Port Madoc	7·71
,,	I. of W., St. Lawrence.	3·13	,,	I. of Man, Douglas	3·14
,,	Alton, Ashdell.....	3·60	XII.	Stoneykirk, Ardwell Ho.	3·22
III.	Winslow, Addington ...	4·01	,,	Melrose, Abbey Gate...	1·27
,,	Oxford, Magdalen Col...	3·51	XIII.	N. Esk Res. [Penicuick]	1·65
,,	Northampton	3·62	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	2·38	,,	Glasgow, Queen's Park.	2·49
,,	Wisbech, Bank House..	3·04	XV.	Islay, Gruinart School..	2·51
IV.	Southend	2·34	XVI.	St. Andrews, Pilmour Cot	1·67
,,	Harlow, Sheering	2·78	,,	Balquhidder, Stronvar..	5·51
,,	Rendlesham Hall	2·49	,,	Dunkeld, Inver Braan..	2·74
,,	Diss	2·81	,,	Dalnaspidal H.R.S. ...	5·21
,,	Swaffham	3·37	XVII.	Keith H.R.S.	2·64
V.	Salisbury, Alderbury...	3·78	,,	Forres H.R.S.	·93
,,	Warminster	4·19	XVIII.	Strome Ferry H.R.S....	4·88
,,	Calne, Compton Bassett	4·82	,,	Lochbroom	3·38
,,	Ashburton, Holne Vic..	8·13	,,	Tain, Springfield.....	·90
,,	Holsworthy, Clawton...	3·57	,,	Loch Shiel, Glenaladale	8·96
,,	Hatherleigh, Winsford.	4·92	,,	Invergarry	5·39
,,	Lynmouth, Glenthorne.	4·52	XIX.	Lairg H.R.S.	1·59
,,	Probus, Lamellyn	4·16	,,	Forsinard H.R.S.	3·73
,,	Wincanton, Stowell Rec.	3·59	,,	Watten H.R.S.	1·22
,,	Wells, Westbury.....	3·77	XX.	Dunmanway, Coolkelure	7·48
VI.	Bristol, Clifton	6·43	,,	Fermoy, Gas Works ...	2·27
,,	Ross	3·27	,,	Tralee, Castlemorris ...	2·23
,,	Wem, Sansaw Hall.....	3·24	,,	Tipperary, Henry Street	2·71
,,	Cheadle, The Heath Ho.	3·57	,,	Newcastle West	2·25
,,	Worcester, Diglis Lock	3·51	,,	Miltown Malbay.....	2·51
,,	Coventry, Coundon	4·00	,,	Corofin	...
VII.	Melton, Coston	2·91	XXI.	Carlow, Browne's Hill..	1·83
,,	Ketton Hall [Stamford]	3·11	,,	Navan, Balrath	2·14
,,	Horncastle, Bucknall ...	2·47	,,	Mullingar, Belvedere ...	2·57
,,	Mansfield, St. John's St	2·59	,,	Athlone, Twyford	3·30
VIII.	Macclesfield, The Park.	...	XXII.	Galway, Queen's Col....	2·88
,,	Walton-on-the-Hill.....	3·43	,,	Clifden, Kylemore	5·67
,,	Lancaster, South Road.	3·51	,,	Crossmolina, Enniscoe..	3·70
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	1·84
IX.	Wakefield, Stanley Vic.	1·80	XXIII.	Dowra	...
,,	Ripon, Mickley	2·41	,,	Rockcorry.....	2·19
,,	Scarborough.....	1·49	,,	Warrenpoint	3·30
,,	East Layton [Darlington]	2·25	,,	Newtownards	·63
,,	Middleton, Mickleton ..	1·95	,,	Belfast, New Barnsley .	2·83
X.	Haltwhistle, Unthank..	1·69	,,	Cushendun	2·51
,,	Shap, Copy Hill	3·65	,,	Bushmills	2·15
XI.	Llanfrechfa Grange	5·79	,,	Stewartstown	2·01
,,	Llandovery	4·94	,,	Buncrana	2·56
,,	Castle Malgwyn	4·27			

NOVEMBER, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	3·31	+ ·87	·68	26	18	58·7	30	28·3	17	5	13
II.		Maidstone (Hunton Court)...	2·42	— ·48	·50	26	16	...	...	...	...	...	...
,,		Strathfield Turgiss	3·26	+ ·51	·52	26	18	58·7	3	29·0	18	6	11
III.		Hitchin	3·40	+ ·79	·39	26	19	55·0	29	23·0	17	10	...
,,		Banbury	4·14	+ 1·43	1·10	3	18	56·0	28*a*	25·0	18	6	...
IV.		Bury St. Edmunds (Culford)	2·97	+ ·14	·52	30	20	58·0	28	22·0	15	9	...
,,		Norwich (Cossey).....	2·79	— ·52	·44	3	17	58·0	28*a*	27·0	16	8	14
V.		Weymouth(LangtonHerring)	3·35	...	·65	3	15	...	...	...	...	...	...
,,		Barnstaple.....	2·81	— 1·34	·52	27	14	59·0	29	33·0	17	0	...
,,		Bodmin	4·56	— ·76	1·00	25	21	57·0	29	34·0	15*b*	0	4
VI.		Stroud (Upfield)	4·00	+ 1·06	·81	2	16	55·0	29	28·0	15*c*	...	...
,,		ChurchStretton(Woolstaston)	3·57	+ ·13	·62	27	22	55·5	29	26·0	16*d*	5	11
,,		Tenbury (Orleton)	3·24	+ ·38	·61	26	18	58·7	29	22·0	17	6	7
VII.		Leicester	2·90	...	·39	29	19	56·6	28	25·8	16	5	11
,,		Boston	3·08	+ ·71	·90	3	15	56·0	28	30·0	16	3	...
,,		Grimsby (Killingholme).....	2·24	— ·86	·47	24	16	56·0	2	32·0	6	1	...
,,		Hesley Hall [Tickhill].....	2·10	...	·71	24	17	57·0	28	23·0	17	6	...
VIII.		Manchester (Ardwick).....	2·78	— ·19	·73	27	15	57·0	3	28·0	17	5	...
IX.		Wetherby (Ribston Hall) ...	2·55	— ·21	·62	27	11	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·39	— 2·36	·97	26	17	52·0	27	26·0	16	5	...
X.		North Shields	1·92	— 1·53	·65	26	14	60·5	3	24·5	18	5	7
,,		Borrowdale (Seathwaite).....	10·35	— 1·47	3·38	26	14	54·9	3	23·5	16	5	...
XI.	WALES.	Cardiff (Ely).....	5·70	+ 1·50	1·06	27	13	...	...	...	...	...	...
,,		Haverfordwest	4·31	— 1·03	1·08	26	10	55·0	2, 3	28·0	15*c*	6	9
,,		Plinlimmon (Cwmsymlog) ...	7·15	...	2·18	2	15	...	...	...	...	...	...
,,		Llandudno.....	2·54	— 1·37	·60	27	11	58·8	3	31·0	15	2	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·94	— ·97	1·11	26	14	54·0	3, 4	20·0	18	10	...
,,		Jedburgh (Sunnyside).....	·99	— 2·02	·40	26	10	57·0	3	17·0	18	12	...
XIV.		Douglas Castle (Newmains)	2·66	— ·89	1·21	26	11	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	4·32	— 1·04	·90	26	14	...	...	...	..	...	...
,,		Oban (Craigvarren)	4·44	...	·75	3	15	56·4	4	25·0	18	5	...
,,		Mull (Quinish).....	3·78	...	1·48	2	15	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·60	— ·95	·60	27	10	...	...	...	...	...	...
,,		Arbroath	1·77	— 1·38	·64	26	13	56·0	3	22·0	18	6	...
XVII.		Braemar	3·82	+ ·05	2·02	26	13	58·0	3	9·5	18	13	22
,,		Aberdeen	2·07	...	·55	26	17	59·0	2	18·0	17	11	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	7·20	— 1·98	...	...	...	59·0	3	23·0	16	11	21
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		Orkney (Sandwick).....	2·07	— 1·37	·42	6	14	57·7	3	29·5	14	3	...
XX.	IRELAND.	Cork (Blackrock).....	3·76	— ·85	·93	25	21	59·0	29	29·0	...	2	...
,,		Dromore Castle	6·23	...	1·00	1	16	58·0	16	30·0	14	...	...
,,		Waterford (Brook Lodge) ...	3·73	...	1·39	25	18	54·5	29	27·5	15	1	9
,,		Killaloe	2·50	...	·36	4	15	54·0	2	27·0	15	6	...
XXI.		Portarlington	1·56	— ·84	·30	25	19	59·0	4	28·0	14	4	...
,,		Dublin (FitzWilliam Square)	2·40	— ·12	·88	26	17	62·1	3	31·0	15	1	10
XXII.		Ballinasloe	2·24	— ·76	·44	2	16	54·0	2, 7	23·0	15	6	...
XXIII		Waringstown	1·64	— 1·07	·70	26	11	60·0	3	21·0	14	7	10
,,		Londonderry (Creggan Res.).	2·63	...	·57	4	18	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·64	— ·41	·53	25	16	57·0	28	28·0	16	6	..

a And 29. *b* And 16. *c* And 17. *d* And 18.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON NOVEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The cold frosty weather of the middle of the month, assisted materially by intermittent fresh winds from the E.N.E, afforded excellent opportunity for wheat sowing.

BANBURY.—Very heavy R fell on 3rd, causing floods, followed by a fortnight of cold weather, tolerably dry but misty; the last week was wet and milder. Mean temp. (42°·7) slightly above the average. Fog on 3 days, wet mist on 5, high wind on 2.

CULFORD.—A very wet month, with occasional frosts and wind, and but little sunshine.

LANGTON HERRING.—Rainfall ·29 in. and mean temp. slightly, below the average. From 6th to 12th there was scarcely any variation of pressure or of temp.. and very little sunshine, the prevailing wind being N.E. Fog on 21st and 22nd.

BODMIN.—A very mild November; mean temp. 46°·1.

WOOLSTASTON.—R and fog prevailed during the greater part of the month; mean temp. 40°·3.

ORLETON.—The first half of the month was cloudy and gloomy with an average temp. and not much R; from the 15th to the 19th severe frost occurred every morning with a dry cold wind; the remainder of the month was very stormy with heavy falls of R and little sunshine. The fluctuations of pressure during the month were great and frequent; on the 28th and 29th the rivers Teme and Severn were much flooded. Mean temp. about 0°·7 above the average.

LEICESTER.—A dull and dreary month, mist and fog prevailing almost every day; there were a few sharp frosts; H on 27th.

KILLINGHOLME.—The weather was very unsettled but not severe; there was a good deal of strong wind, but no gale to do damage.

MANCHESTER.—A fairly seasonable month, though without much frost; the weather generally was dull, but there were a few days of bright sunshine.

NORTH SHIELDS.—Fog on seven days, S on one only.

SEATHWAITE.—There was a long spell of dry weather in the middle of the month, but on the three days, 2nd to 4th, 3·66 in. of R fell, and on the 26th and 27th, 5·11 in.

WALES.

HAVERFORDWEST.—The month commenced, wet; very dark, calm weather with rather low temp. set in on the 9th, and continued to the 13th, when R fell; from 14th to 25th was very cold with keen easterly winds and a very wet stormy period closed the month. One of the most unfortunate Autumns remembered. Some barley could not be taken in until the fine calm weather between the 14th and 25th; dense fog on 29th.

LLANDUDNO.—A dull November, though exempt from storms; polar winds chiefly prevailed from 8th to 25th. Mean temp. and range of temp. both slightly below the average. H on 5th and 14th.

SCOTLAND.

CARGEN.—A remarkably dull and gloomy month, with only 32 hours of sunshine, the average being 92 hours; mean temp. 0°·6 below average.

JEDBURGH.—Rainfall smaller than in any November of the previous 20 years, and springs all over the district were never before known to be so low. The

first three weeks were marked by great stillness of the atmosphere, and little or no sunshine. Primroses were in bloom on 10th.

OBAN.—A very fine month, and an early arrival of frost without being followed by the usual stormy sequence is the feature in this district. S on 5th and 13th; H on 5th and 27th; first frost on 13th; very fine aurora on 18th, heavy gale on 27th.

QUINISH.—The first week was wet and stormy, the remainder of the month very fine.

ABERDEEN.—Rainfall considerably below the average; aurora seen on 5th; S and sleet on 14th; lunar corona on 15th.

CULLODEN.—An unusually dry month, frost prevailing more or less throughout.

IRELAND.

WATERFORD.—A very mild month, rainfall about the average; there were ripe strawberries in the garden on 16th.

KILLALOE.—A fine open month, with moderate rainfall and mild temp.

DUBLIN.—A mild, very dull month, S.E. and E. winds preponderating to a remarkable extent; the rainfall was very small up to 21st, but a stormy rainy period followed, lasting nearly to the close. The month was very mild (mean temp. 45°·1), but not so mild as November, 1881 (49°·4) which was by far the warmest November in 20 years. November was also warmer in 1866 (45°·4), and in 1874 (45°·8) than in the present year. There was actually an increase of temp. from October to November. H on 15th, sleet on 4th, lunar corona on 21st, fog on 6 days. Mean temp. 1°·4 above the average; mean humidity 88; mean amount of cloud 6·7; prevailing winds S.E. and E.

WARINGSTOWN.—A wonderfully dry and fine month.

EDENFEL.—The first and last weeks were wet and unsettled; the intermediate fortnight was calm and fine, and occasionally clear and frosty; the number of rainy days was considerably less than the average.

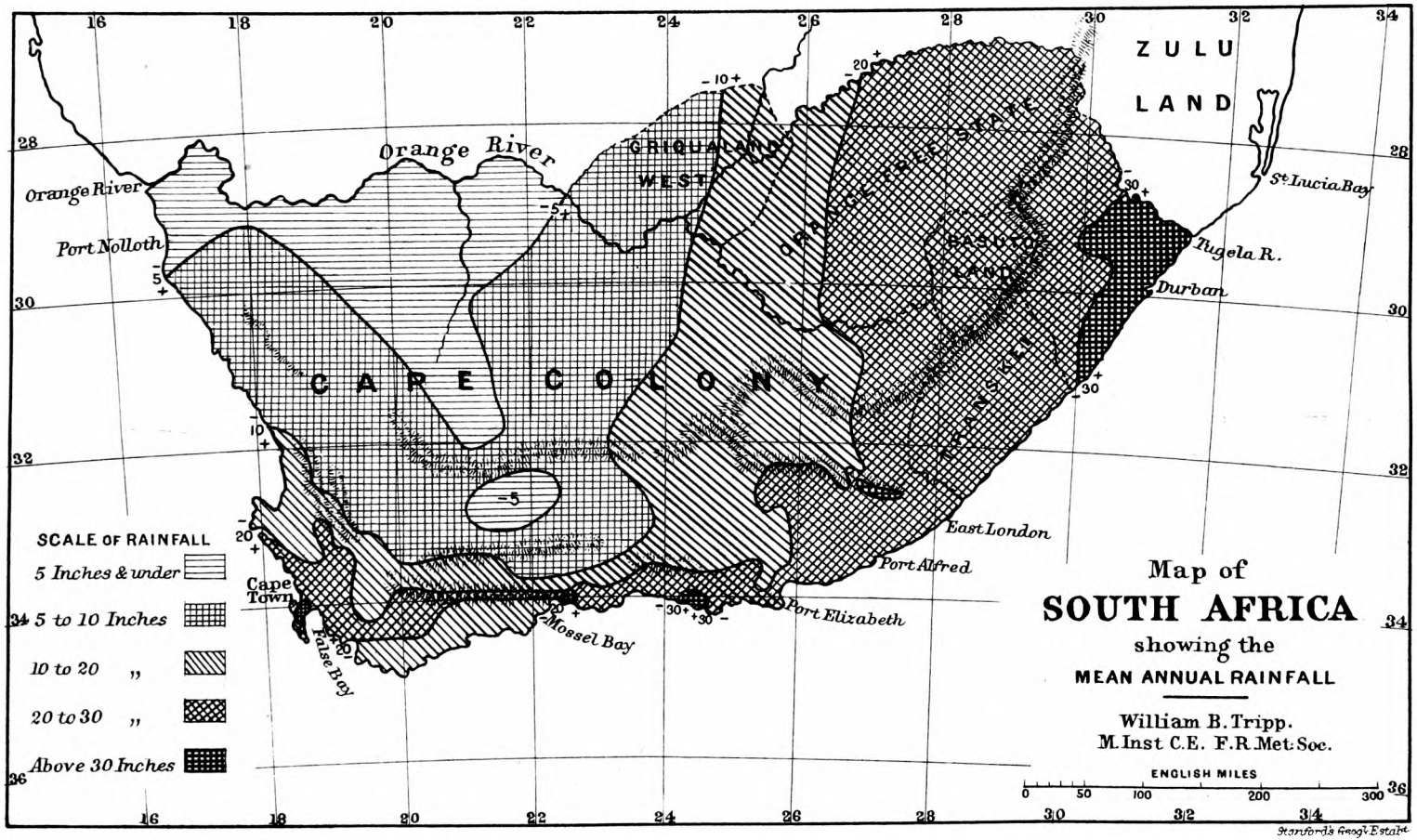
EARLY RECORDS OF FROST.

To the Editor of the Meteorological Magazine.

SIR,—In Burton's "Chronology of Stamford" I find that "a very severe frost commenced in October, 760, and continued to February, 761. Also another from the beginning of November, 1076, to April, 1077. In November, 1844, a frost set in and continued with very little intermission until April, 1845; the greatest degree of cold was on Friday morning, the 14th of March."—I am, Sir, yours faithfully,

FRED. COVENTRY.

Ketton Hall, Stamford, June 2nd, 1885.


Map of
SOUTH AFRICA
showing the
MEAN ANNUAL RAINFALL
William B. Tripp.
M. Inst C.E. F.R.Met.Soc.
SCALE OF RAINFALL
5 Inches & under
5 to 10 Inches
10 to 20 ,,
20 to 30 ,,
Above 30 Inches
ENGLISH MILES
0 50 100 200 300
CAPE COLONY
Orange River
Orange River
Port Nolloth
GRIQUALAND WEST
BASUTO LAND
ZULU LAND
St. Lucia Bay
Tugela R.
Durban
East London
Port Alfred
Port Elizabeth
Mossel Bay
Cape Town
False Bay
Stanford's Geogl Estabt

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RAINFALL IN SOUTH AFRICA.

BY WILLIAM B. TRIPP, M.INST.C.E., F.R.Met.Soc.

1. Little has been known until recently on the subject of Rainfall in South Africa, taken broadly over the whole country, although observers have for many years been keeping records at isolated stations.

2. There has also been for many years a Meteorological Commission in existence at Cape Town, and in the report for 1883 an interesting table was published giving the means, monthly and yearly, at all stations where records have been kept for at least five years, with the altitude above sea level, and the latitude and longitude for each station.

There are also given in the reports several additional records of stations where the registers are not complete.

From these data the writer has coloured a map of South Africa, with the idea of showing the distribution of the total yearly rainfall; the curves divide the area into districts where the mean yearly rainfall is--

(1) Under 5 inches.
(2) From 5 ,, to 10 inches.
(3) ,, 10 ,, ,, 20 ,,
(4) ,, 20 ,, ,, 30 ,,
(5) Above 30 ,,

He has also compiled a table which gives the quarterly rainfall at some of the stations above referred to, at which records have been kept for at least five years, with other particulars of altitudes and wettest months, &c.

With regard to the map, there are many parts where the results are merely approximate.

The positions also of many places on even the best published maps of South Africa do not agree with their positions as indicated by the latitudes and longitudes given in the reports, indicating that the former positions are in many cases erroneous.

These differences would make, in many cases, a considerable

difference in the position of the curves, &c.; in fact, a new and thoroughly revised map of South Africa is much required.

There are also, doubtless, particularly along the mountain ranges, many wet strips and spots where no definite records are kept, and which, therefore, cannot at present be shown on the map. Multiplication of records, as well as general local knowledge, will, no doubt, reveal many such places.

3. South Africa may be described as a central table land, rising in successive terraces from the sea coast. The country has been subject to great erasion from water, and the mountains with which the country is studded, and the deep valleys, locally termed "kloofs," with which it is intersected, are principally due to this cause.

In some cases the hills are covered with forests, but generally they are now denuded of such covering. Where forests still exist, the author considers it probable that the rainfall is much greater than would be the case if they did not. The hills themselves are, however, doubtless the chief agents in causing precipitation, and they have, of course, to be taken as they are found in nature; while the hand of man can, in many cases, clothe them with forests, and the author considers this to be most important. For there is this difference in the result of the rainfall, as its useful effects are seen in the streams which issue from the mountain "kloofs." When these take their rise in an area denuded of forest, their volumes are highly variable, their beds being dry for, in some cases, 300 days in the year; their only existence being, in fact, as torrents after sudden thunderstorms.

When, however, it fortunately happens that the streams take their rise in an area still largely clothed with forests, they are frequently perennial, as the action of the forest tends to keep the soil moist and cool, preventing evaporation and enabling the rain to soak into the ground and fill the underground reservoirs, from which it flows in constant streams capable of being utilised in various ways for the service of man; whereas in the other case, the effects of the rain are transient and much less valuable, and in many cases disastrous.

Thus forests, where they exist, produce a result similar to that which could be effected by the construction, at considerable cost, of a series of storage reservoirs. The author therefore considers it of the highest importance, for various climatic and economic reasons, that the efforts which have been inaugurated of late years by the Cape Government for the preservation, renewal, and creation of forests should be continued with energy and perseverance.

4. The climate over such a large tract of country as South Africa varies, of course, considerably; the rainfall varies from 2 in. to 50 or 60 in. doubtless, and perhaps more in some of the mountain districts; in the N.W. corner of Natal it is considerably over 30 in.

Dividing the country according to the half-yearly distribution of rainfall, we find tat on the western and southern sides the fall is generally greater in the winter half of the year from April to Septem-

ber, than in the summer half from October to March ; May, June and July being the wettest months, and the N.W. the general rain-bearing wind. On the eastern side, however, the fall is greater in the summer half, March and February being the wettest months, and the S.E. the rain-bearing wind.

On the south east coast these dividing line between these two different characteristics appears to run out to sea very nearly at Port Alfred, where the fall in both halves of the year appears to be very nearly identical, that in the summer half being rather the greater of the two.

The writer resided and kept records for some years at King William's Town in the Eastern province, where on a total of 283 days, from June 1880, to May 1883, 70 in. of rain were registered, 30·25 in. of which (recorded on 242 days) were made up of falls under 0·50 of an in., 19·88 in. (on 28 days) from 0·50 in. to 1 in., and 19·87 in. (on 13 days) of falls of from 1 in. or upwards in twenty-four hours.

The heaviest fall on any one day was 2·04 in., and the next heaviest fall was 3·11 in. in 48 hours.

Although this record proves that the rains are moderate and tolerably distributed, and do not all occur in sudden storms, yet the writer has heard accounts of sudden falls there of a very different character, and most disastrous in their results.

Quarterly Rainfall at some of the Stations given in the Report of the Cape Town Meteorological Commission for 1883, at which records have been kept for at least five years, with the height of the station above sea level, and division into the Meteorological Districts.

LOCALITY, &c.	Elevation above Sea Level	Jan. to March.	April to June.	July to Sept.	Oct. to Dec.	Totals.	Wettest Month.
	ft.	in.	in.	in.	in.	in.	
1.—CAPE PENINSULA. *Six Stations given in the Report.*							
Royal Observatory.....	37	2·24	10·18	8·91	3·48	24·81	June
Bishops Court	250	3·97	21·52	19·84	8·23	53·56	June
June is the wettest month at all stations except Simon's Town, at which May and July are equal, and have the fall slightly greater.							
2.—SOUTH WEST. *Nine Stations.*							
Somerset West	100	2·20	9·20	9·05	3·72	24·17	July
Stellenbosch	400	2·05	9·71	8·63	4·27	24·66	May
Paarl	500	1·89	11·29	11·44	5·41	30·03	June
Robertson	600	1·72	3 54	3·36	2·27	10·89	April
July has the greatest fall at four out of the nine stations, May comes next with three, April and June follow with one each.							
3.—WEST COAST. *Six Stations.*							
Groote Port, Malmesbury ...		1·56	7·13	7·11	2·71	18·51	May
Clan William	300	0·69	3·75	3·31	1·46	9·21	July
Piquetberg	770	1·51	5·92	6·51	3·50	17·44	Aug
At three stations May has the greatest fall, at two July, and at one August.							

4.—SOUTH COAST. *Seven Stations.*

Bredasdorp	250	4·46	5·13	5·29	3·85	18·73	Mar.
Mossel Bay	105	4·32	3·53	5·02	3·10	15·97	Feb.
Port Elizabeth.....	181	4·48	6·19	6·19	6·09	22·95	May

At four stations March is the wettest month, May and October at one each.

5.—SOUTHERN KARROO. *Five Stations.*

Lady Smith	2000	3·19	3·38	3·34	2·02	11·93	April
Amalienstein	1500	3·63	3·58	3·17	3·36	13·74	May
Ondtshorn	1000?	1·92	2·41	2·75	1·45	8·53	Aug.

April and August are wettest at two stations each, and May at one.

6.—WEST CENTRAL KARROO. *Six Stations.*

Prince Albert	2100	2·14	2·97	1·14	1·46	7·71	April
Lower Nels. Poort.....	3100	4·81	1·87	1·51	1·93	10·12	Mar.

At five out of the six stations March has the greatest fall, at the remaining one April.

7.—EAST CENTRAL KARROO. *Nine Stations.*

Graaff Reinet	2500	5·48	2·62	2·22	4·22	14·54	Feb.
Somerset East...	2400	8·80	3·71	2·97	5·97	21·45	Mar.

March is the wettest month at seven stations, February at two.

8.—NORTHERN KARROO. *Twelve Stations.*

Cradock	2856	6·49	2·21	1·78	2·71	13·19	Mar.

March is the wettest month at all the stations.

9.—NORTHERN BORDER. *Three Stations.*

Pella	1800	0·78	0·97	0·22	0·24	2·21	May
Hopetown.....	3600	5·80	1·79	1·07	2·07	10·73	Mar.

At two stations March, and at one May, are the wettest months; there is no rain at Pella in November.

10.—SOUTH EAST. *Nine Stations.*

Grahams Town	1800	8·67	5·45	6·24	8·43	28·79	Mar.
King Williams Town...	1314	9·47	4·29	4·12	7·84	25·72	Feb.
East London, W.	20	7·95	6·66	6·79	6·52	27·92	Mar.

March wettest month at eight, February at one station.

11.—NORTH EAST. *Three Stations.*

Queens Town	3500	10·11	2·86	1·69	5·98	20·64	Mar.
Aliwal, N.	4400	12·37	3·66	1·74	6·91	24·68	Feb.

March wettest at two, February at one station.

SUMMARY OF WETTEST MONTHS.

March	at	40	stations.
May	,,	9	,,
July	,,	6	,,
June	,,	6	,,
Feb.	,,	5	,,
April	,,	4	,,
Aug.	,,	3	,,
Oct.	,,	1	,,
Also May and July equal and wettest at		1	,,
Total ...		75	stations given in the Report.

REVIEWS.

Lightning Conductors, their History, Nature and Mode of Application. By RICHARD ANDERSON, F.C.S., &c. Third Edition, revised, rearranged and enlarged. 8vo., xv.—470 pages. London: E. and F. N. Spon, 1885.

WE are glad to find that Mr. Anderson's work upon Lightning Conductors has reached a third edition, and to note that in its preparation the author has had the assistance of the long and varied experience of Dr. R. J. Mann. The book is so large and so good that one might almost dismiss it with the verdict that it tells everything that there is to tell about lightning conductors, and never leads one wrong; but as it has got to the 3rd edition, it may get to the 13th, and if so, some of the following remarks may be useful.

It wants a list of engravings; such a list often enables one to turn up a paragraph readily, and in this book it might have prevented some repetitions, *e.g.*, page 344 and 234. We may mention that the engravings are numerous and generally very good, but on p. 179, a faulty engraving in Callaud's *Traité* has been copied as accurately as the Chinaman did when he cracked all the 24 new plates in the places corresponding to the crack in the pattern one. There are two other things to note about the engravings. Mr. Anderson is (rightly we think) an advocate for conductors in the form of tape rather than of rope. We have been so amused by the frequency with which he gives engravings of rope as compared with tape, as to have had them counted with the curious result that there are nearly three times as many representations of rope as of tape. Sometimes engravings appear without explanatory text, *e.g.*, on p. 118 there is a little gem, illustrative of the area of protection afforded by a conductor on a church tower, but we can find no reference to the engraving in any part of the volume, and the subject does not appear to be even mentioned within 11 pages of the engraving.

Mr. Anderson quotes the case of Mrs. Pidgeon, who was struck and marked by lightning near Torquay, but he does not seem to have heard of the clenching case of the boy George Gunn, of Dunse, Berwickshire, in which the so-called tree form was photographed before it faded away.* And similarly he has overlooked the remarkable parallelism between the accident near Crieff, of which he gives an excellent engraving on p. 312, and the accident at Lilleshall, in Shropshire, in 1884, reported and engraved in the *Quar. Jour. Roy Met. Soc.*, Vol. XI., p. 7.

His list of accidents and his bibliography are very valuable, but each will bear a little more time spent upon it: *e.g.*, p. 322, Rubinslaw should be Rubislaw; p. 324, "West End Church, near Southampton," and "St. James's Church, West End, Hants," are probably identical; p. 325, "Clevendon" should be "Clevedon," and "Rolley' "Trolley."

* *Met Mag.*, Vol. XVIII. (1883), pp. 81, 104, 120.

So, again, in the list of books there are a lot of little trifles which may as well be put right: *e.g.*, on p. xi. "Fait E. M." should be "Macfait E." or "Fait E. Mac." "Forster, J." should be "Forster, T.," and the description of the two editions of Ganot are rather "mixed."

These, however, are all trifles, and the book itself, like one of Captain Toynbee's logs, may be dismissed with the title "Excellent."

Report on the East Anglian Earthquake of April 22nd, 1884. By RAPHAEL MELDOLA, F.C.S., &c., and WILLIAM WHITE, F.E.S. (*Essex Field Club Special Memoirs, Vol. I.*) 8vo., x.—224 pages, 19 cuts and 4 plates. London: Macmillan & Co., 1885.

Events follow each other in such swift succession that even the great English earthquake—certainly the greatest for four centuries—is on the high road to oblivion within two years of its occurrence. Professor Meldola's report is, however, well worth waiting for; it is a very thorough piece of work, and the way in which he dissects both popular notions and scientific theories is quite amusing. The result is that we have in one volume a complete account of the earthquake, with its damage to 20 churches, 11 chapels and 1,213 buildings, and yet without the loss of one human being, and an exhaustive criticism on all branches of the subject.

Nor have Messrs. Meldola and White been left alone in the work, for though on them has fallen all the actual labour of writing the report, they have had help from two of the most experienced living seismologists—Prof. Ewing, a past President of the Seismological Society of Japan, and Prof. Milne, the present Secretary of that great Earthquake Society. Among the geologists whose views are reported we note several members of the Geological Survey, *e.g.*, Messrs. Holmes, Kinahan, Topley and Whitaker, also Prof. O'Reilly and Mr. Woodward. With reference to the disturbance of the level of water in wells, there are the views of Prof. Bonney, F.R.S., Mr. Clegg, C.E., Mr. Radford Sharpe, and Mr. De Rance, F.G.S.

As we have already stated, it is at least four hundred years since an equally violent earthquake has occurred in this country; it is fortunate for science that the Essex Field Club possessed two members with the knowledge and the industry requisite to produce such a report out of the chaos of manuscript which had been collected, and that the Club has had the courage to incur the cost of printing and illustrating it. Let all who wish well to a rising scientific society, and all who are interested in earthquakes, British or Foreign, support the Club and encourage those who have had the labour of preparing the report by procuring a copy, which we are sure will interest them and instruct them.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1885.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	84·7	4	41·4	11	70·9	50·7	48·3	67	127·4	36·4	1·99	11	4·9
Malta	90·4	19	58·8	8	79·9	64·8	61·5	71	140·6	...	·00	0	1·4
Cape of Good Hope	71·2	1	34·0	1	63·3	46·8	...	...	...	...	6·18	13	4·7
Mauritius	79·2	1	59·8	21	75·0	65·3	60·3	74	123·6	46·2	4·36	22	5·3
Calcutta	103·3	2	76·2	19	92·7	79·4	77·7	80	162·5	72·4	11·40	18	6·9
Bombay	92·7	8	77·0	11	89·0	81·1	77·3	78	153·2	74·2	5·11	22	6·7
Ceylon, Colombo	86·7	11*a*	72·6	7	83·8	75·6	74·3	84	150·0	65·0	18·82	26	8·5
Melbourne	62·1	1	30·2	22	53·8	42·8	42·4	81	114·3	21·1	3·63	18	7·2
Adelaide	62·5	1	36·0	12	57·6	45·4	43·4	74	120·8	26·3	3·23	24	6·1
Wellington	60·3	8	34·5	24	55·7	44·1	44·7	83	115·0	29·5	3·87	9	3·8
Auckland	62·5	28	40·0	15	59·1	48·8	47·8	79	118·0	29·0	2·16	12	6·8
Jamaica, Kingston	92·0	27	70·6	13	87·0	74·0	73 0	77	...	...	·46	...	5 3
Barbados	84·0	27	71·0	var.	82·0	73·0	74·4	82	145·0	...	2·47	15	7·0
Toronto	79·1	27	41·5	9	70·8	49·0	51·2	70	...	34·5	4·19	12	5·0
New Brunswick, Fredericton	86·7	26	35·5	7	73·2	48·4	51·1	70	...	...	3·33	18	6·2
Manitoba, Winnipeg	83·8	30	31·4	8	71·0	47·2	53·3	73	...	...	3·05	12	5·0
British Columbia, Victoria	5·0	27	41·0	2	65·7	48·6	...	...	...	...	·25	8	...

a And 27. *b* And 15.

REMARKS, JUNE, 1885.

MALTA—Mean temp. 71°·1 ; mean hourly velocity of wind 9·5 miles ; sea temp. rose from 70° to 77°. J. SCOLES.

Mauritius.—Rainfall 2·14 in. above, mean temp. 0°·7, and mean hourly velocity of wind 0·2 mile below average ; prevailing wind S.E. by E, extremes of velocity 28·9 miles on 10th and 1·9 mile on 25th. C. MELDRUM, F.R.S.

Colombo.—TSS on 1st, T on 3, and L on 6 other days. J. H. SYMONDS.

Melbourne.—Mean temp. of air 1°·4 and of dew point 1°·0 below average ; rainfall 1·71 in., humidity slightly, and amount of cloud ·6 above average ; prevailing winds N. and W., strong breezes on 9 days ; L on 3 days, H on 1, dense fog on 4. R. L. J. ELLERY, F.R.S.

Adelaide.—Rainfall nearly 0·60 in. and mean pressure 0·110 in. above the average of 28 years ; mean temp. more than 2° below the average. W. E. COOKE.

Wellington.—A fine month with few wet days ; N.W. wind till 20th, frequently strong, then easterly and light ; mean temp. (49°·9) 0°·9 above the average ; rainfall 1·38 in. below the average. T on 8th. fog on 3 days. R. B. GORE.

Auckland.—An unusually fine month ; rainfall not half the average ; mean temp. about the average of 18 years ; pressure considerably above the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall only half the average, and the continual drought was severely felt over the greater part of the Island. A slight shock of earthquake was felt in St. David's between 7 a.m. and 8 a.m. on 16th. MAXWELL HALL.

BARBADOS.—Rainfall very small, the total for June having been less on only six occasions in 34 years ; mean temp. (76°) about the average ; pressure unsteady ; mean hourly velocity of wind 13·4 miles, 10 per cent. above the average ; extremes 18·4 miles and 8·8 miles. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain
		in.			in.
II.	Dorking, Abinger	1·50	XI.	Rhayader, Nantgwillt..	3·34
,,	Margate, Birchington...	1·08	,,	Carno, Tybrith	2·01
,,	Littlehampton	1·13	,,	Corwen, Rhug	1·14
,,	Hailsham	1·21	,,	Port Madoc	2·55
,,	I. of W., St. Lawrence.	1·81	,,	I. of Man, Douglas	2·11
,,	Alton, Ashdell.....	1·86	XII.	Stoneykirk, Ardwell Ho.	1·75
III.	Winslow, Addington ...	·96	,,	Melrose, Abbey Gate...	1·45
,,	Oxford, Magdalen Col...	1·02	XIII.	N. Esk Res. [Penicuick]	1·85
,,	Northampton	·63	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	·79	,,	Glasgow, Queen's Park.	2·19
,,	Wisbech, Bank House..	·80	XV.	Islay, Gruinart School..	3·74
IV.	Southend	1·08	XVI.	St. Andrews, Pilmour Cot	1·01
,,	Harlow, Sheering	·89	,,	Balquhidder, Stronvar..	6·62
,,	Rendlesham Hall	1·06	,,	Dunkeld, Inver Braan..	2·70
,,	Diss	1·30	,,	Dalnaspidal H.R.S. ...	5·28
,,	Swaffham	1·39	XVII.	Keith H.R.S.	2·32
V.	Salisbury, Alderbury...	1·42	,,	Forres H.R.S.	1·78
,,	Warminster	1·27	XVIII.	Strome Ferry H.R.S....	10·71
,,	Calne, Compton Bassett	1·27	,,	Lochbroom	10·16
,,	Ashburton, Holne Vic..	3·73	,,	Tain, Springfield.....	1·45
,,	Holsworthy, Clawton...	1·74	,,	Loch Shiel, Glenaladale	18·81
,,	Hatherleigh, Winsford.	3·16	,,	Invergarry	9·60
,,	Lynmouth, Glenthorne.	2·09	XIX.	Lairg H.R.S.	1·98
,,	Probus, Lamellyn	2·00	,,	Forsinard H.R.S.	2·33
,,	Wincanton, Stowell Rec.	1·41	,,	Watten H.R.S.	2·87
,,	Wells, Westbury.....	1·64	XX.	Dunmanway, Coolkelure	4·42
VI.	Bristol, Clifton	1·23	,,	Fermoy, Gas Works ...	1·87
,,	Ross	1·02	,,	Tralee, Castlemorris ...	2·02
,,	Wem, Sansaw Hall.....	·52	,,	Tipperary, Henry Street	1·81
,,	Cheadle, The Heath Ho.	1·07	,,	Newcastle West	2·11
,,	Worcester, Diglis Lock	1·07	,,	Miltown Malbay.....	1·83
,,	Coventry, Coundon	·59	,,	Corofin	...
VII.	Melton, Coston	·87	XXI.	Carlow, Browne's Hill..	·82
,,	Ketton Hall [Stamford]	·92	,,	Navan, Balrath	·90
,,	Horncastle, Bucknall ...	·80	,,	Mullingar, Belvedere ...	1·07
,,	Mansfield, St. John's St	·63	,,	Athlone, Twyford	1·07
VIII.	Macclesfield, The Park.	2·38	XXII.	Galway, Queen's Col....	1·22
,,	Walton-on-the-Hill.....	1·64	,,	Clifden, Kylemore	2·75
,,	Lancaster, South Road.	1·39	,,	Crossmolina, Enniscoe..	2·90
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	2·01
IX.	Wakefield, Stanley Vic.	·31	XXIII.	Dowra	...
,,	Ripon, Mickley	·71	,,	Rockcorry.....	1·71
,,	Scarborough.....	1·09	,,	Warrenpoint	1·29
,,	East Layton [Darlington]	·61	,,	Newtownards	·68
,,	Middleton, Mickleton ..	1·23	,,	Belfast, New Barnsley..	2·20
X.	Haltwhistle, Unthank..	1·65	,,	Cushendun	4·05
,,	Shap, Copy Hill	3·56	,,	Bushmills	2·73
XI.	Llanfrechfa Grange	1·97	,,	Stewartstown	1·47
,,	Llandovery	2·44	,,	Buncrana	2·97
,,	Castle Malgwyn	1·49			

DECEMBER, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max Deg.	Date	Min. Deg	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·05	— 1·12	·35	5	11	50·8	4	22·3	11	13	23
II.		Maidstone (Hunton Court)...	·85	— 1·55	·32	5	9	...	...	...	...	..	...
,,		Strathfield Turgiss	1·02	— 1·00	·33	5	12	50·6	17	19·3	11	15	19
III.		Hitchin	·77	— 1·28	·26	30	12	46·0	3	21·0	8*a*	20	...
,,		Banbury	·61	— 1·54	·14	5	12	50·0	3*b*	21·0	11	19	...
IV.		Bury St. Edmunds (Culford)	·95	— 1·20	·42	30	10	51·0	17	13·0	10	16	...
,,		Norwich (Cossey)	1·22	— 1·10	·30	30	12	50·5	17	19·0	12	12	19
V.		Weymouth(LangtonHerring)	1·77	...	·85	5	13	...	...	...	...	...	...
,,		Barnstaple.....	2·06	— 1·70	·63	5	14	56·0	1	22·0	11	...	...
,,		Bodmin	2·51	— 2·94	1·24	5	16	51·0	17	22·0	11	7	13
VI.		Stroud (Upfield)	1·06	— 1·37	·45	5	11	50·0	3*c*	20·0	10	17	...
,,		ChurchStretton(Woolstaston)	·91	— 1·88	·14	28	17	50·0	16*b*	22·0	8, 9	13	17
,,		Tenbury (Orleton)	·93	— 1·58	·20	28	15	52·3	17	17·3	11	17	19
VII.		Leicester	·65	...	·19	30	11	52·2	23	22·2	11	12	22
,,		Boston	·93	— 1·14	·33	30	8	50·0	16	17·0	11	14	...
,,		Grimsby (Killingholme).....	·84	— 1·59	·21	9	12	51·0	16	20·0	12	8	...
,,		Hesley Hall [Tickhill].....	·96	...	·25	4	11	54·0	16	21·0	10	12	...
VIII.		Manchester (Ardwick).....	2·65	+ ·12	·83	30	11	51·0	17	23·0	8*d*	10	...
IX.		Wetherby (Ribston Hall) ...	·31	— 1·90	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·41	— 1·87	·64	30	17	50·0	18	15·0	10	...	...
X.		North Shields	·96	— 2·13	·20	9	12	56·5	16	16·0	11	15	15
,,		Borrowdale (Seathwaite).....	7·54	— 6·19	1·41	30	19	52·8	16	17·7	8	13	...
XI.	WALES.	Cardiff (Ely).....	1·93	— 1·98	·58	5	17	...	...	...	...	...	...
,,		Haverfordwest	2·07	— 3·06	·50	5	10	53·0	16	18·0	10	9	15
,,		Plinlimmon (Cwmsymlog) ...	2·62	...	·67	30	14	...	...	...	...	..	...
,,		Llandudno.....	1·33	— 1·52	·40	30	8	54·0	3	28·0	10*e*	8	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·17	— 2·36	·62	3	12	54·0	16	17·4	11	12	...
,,		Jedburgh (Sunnyside).....	·57	— 1·88	·24	30	7	56·0	2, 3	10·0	11	12	...
XIV.		Douglas Castle (Newmains)	...	...	...	...	...	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory)	5·60	— ·58	1·25	30	23	...	...	...	...	..	...
,,		Oban (Craigvarren)	6·75	...	...	...	23	53·0	16	24·0	7	7	...
,,		Mull (Quinish).....	6·54	...	1·16	30	24	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·10	— 1·56	·80	4	9	...	...	...	...	...	...
,,		Arbroath	1·14	— 1·76	·30	3	10	54·0	16	21·0	7*e*	8	...
XVII.		Braemar	2·92	— ·51	·80	2	12	53·2	16	12·2	7	16	26
,,		Aberdeen	2·28	...	·67	21	16	57·0	16	22·0	10*e*	13	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	2·56	+ ·72	...	...	...	56·0	16	15·3	10	10	21
XIX.		Dunrobin	2·84	...	·56	4	12	58·0	16	21·0	7	11	...
,,		Orkney (Sandwick)	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Cork (Blackrock)	1·78	— 2·98	·29	19	19	57·0	2	24·0	8	9	...
,,		Dromore Castle	2·67	...	·55	2	12	55·0	18	25·0	22	...	...
,,		Waterford (Brook Lodge) ...	1·95	...	·49	5	15	51·5	3	21·5	11	9	18
,,		Killaloe	1·67	...	·27	27	18	56·0	19	23·0	8	15	...
XXI.		Portarlington	·73	— 2·13	·14	3	13	52·0	15	29·0	26	12	...
,,		Dublin (FitzWilliam Square)	·74	— 1·84	·16	5	10	57·7	16	24·3	11	7	17
XXII.		Ballinasloe	1·62	— 1·86	·53	20	21	52·0	16	19·0	11	14	..
XXIII		Waringstown	1·24	— 1·72	·34	28	11	56·0	16	18·0	10	13	14
,,		Londonderry (Creggan Res.).	2·80	...	·54	3	18	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·86	— 1·54	·55	3	16	54·0	16	21·0	10	13	..

a And 10. *b* And 17. *c* And 31. *d* And 9, 11. *e* And 11.

\+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum, T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Cold, damp, foggy weather characterized the month, with occasional intervals of bright sunshine and paroxysms of severe early morning frosts; crops all that could be desired at the close.

BANBURY.—Mean temp. 37°·7. S on 3 days; high wind on 2; fog on 8.

CULFORD.—The temperature during the month was very fluctuating, the frost at times being very severe but not of long duration. S on 9th and 29th.

LANGTON HERRING.—The rainfall was 1·30 in. below the average of December for the last ten years; the mean temp. was more than half a degree below the average, and the pressure was higher than in any month since December, 1883; high winds on 4th and 28th, dense fog on 17th, L on 29th.

BODMIN.—Mean temp. 39°·4.

STROUD.—A cold, gloomy December with very little sun; slight S on the hills on 6th and 29th.

WOOLSTASTON.—The rainfall was very slight, but S fell on 5th, 6th, 28th, and 29th. A severe frost set in on 6th, which lasted a week. Mean temp. 37°·5.

ORLETON.—Mean temp. about 1°·3 below the average of 24 years. The first 12 days were very cold with much clear sky, and severe frost almost every night; the remainder of the month was very changeable with much cloud and fog and occasional frosts. Pressure high throughout, but fluctuating. The wind was frequently rough, especially on 4th and 28th. S on 6th, 28th, and 29th.

KILLINGHOLME.—The month was very dry until the closing days, when S fell which soon disappeared.

MANCHESTER.—December was rather wintry, but there was no fall of S. Hard frost prevailed for several days in the early part of the month, but it was then mild until the last three days. The weather generally was dull, gloomy, and damp, but no very dense fogs occurred. T on 4th.

NORTH SHIELDS.—Mock suns were seen on 28th and 31st; S fell on 6 days, fog occurred on 3.

WALES.

HAVERFORDWEST.—A dry December. Severe frost prevailed from 2nd to 10th, but the temperature for the whole month was rather above the average. During the continuance of the frost the sunsets were very grand and the colourings of the afterglow magnificent. On the 7th, the Precelly range was covered with S to the depth of several inches. From 12th to 19th the air was constantly damp and the sky overcast.

LLANDUDNO.—The wind and weather were rather variable, and there was more than the average amount of frost though of no great severity. The mean temp. was just half a degree below the average, the mean daily range being about half a degree above the average and the monthly range a degree and a half below it. Very little R fell, except on the last four days. S on 29th.

SCOTLAND.

CARGEN.—A dull, gloomy month, with great and sudden variations of temp. and pressure. Mean temp. 38°·8, exactly the average; severe frost prevailed from 6th to 11th. Only 39 hours of sunshine were recorded, the average being 59 hours; for 11 consecutive days (11th to 21st inclusive) only one hour of sunshine was recorded. Remarkably beautiful cloud effects were observed at sunset on 28th and 29th. Gale on 3rd, L on 28th, S on 29th.

JEDBURGH.—The weather was, on the whole, fine and open, and out-door work was scarcely impeded. Springs had not begun to rise, and the ground was very dry at the close. Very high winds prevailed from 27th to 30th inclusive. S on 5 days.

OBAN.—A month remarkable for extraordinary changes of weather and wind—from frost to R and gales. On the whole the commencement was seasonable and frosty, and the second half showery with very high temp, until the heavy S storm of 28th. An unusual absence of sunlight was noted. H on 3rd, 27th and 28th ; S on 28th and 29th ; aurora on 6th ; gales on 7 days.

ABERDEEN.—Rainfall more than an inch below the average ; aurora on 6th, H on 22nd ; S on 3 days.

CULLODEN.—The weather during the month was not very severe ; the keenest frost was from 5th to 11th, and during the remainder of the month the weather was fine and open. S fell to some depth twice.

IRELAND.

BLACKROCK.—The month was notably misty, with very little sunshine and frequent unexpected changes of temp. from unseasonable warmth to sharp frost. Mean temp. 41°·8.

DROMORE.—The month, though it commenced with a terrible storm from S.W., was very fine and mild.

WATERFORD.—A dry and generally mild month with a rainfall less than half the average. S on 4th and 6th ; dense fog on 20th.

KILLALOE.—Sharp frosts prevailed in the early nights of the month, with many bright fine days. The rainfall was light. Mean temp. 41°·0.

DUBLIN.—Very changeable as regards temperature, but generally a fine although cloudy month. Pressure considerably above the average. A sharp frost prevailed between 7th and 12th, and another brief cold spell occurred after the 27th. Mean temp. (42°·2) 0°·7 above the average ; mean humidity 84 ; mean amount of cloud 6·6 ; prevailing winds W., W.S.W., W.N.W. H on 7th and 28th, S and sleet on 4 days ; lunar corona on 23rd, fog on 7 days.

WARINGSTOWN.—A very dry month and, with the exception of one week's hard frost (from 5th to 12th), mild and pleasant.

EDENFEL.—With the exception of the week of dry and pleasant frost, which terminated on 11th, the month was unusually mild and calm, with scanty rainfall.

ROYAL METEOROLOGICAL SOCIETY.

The usual Monthly meeting of this Society was held on Wednesday evening, December the 11th, at the Institution of Civil Engineers ; Mr. R. H. Scott, F.R.S., president, in the chair.

Mr. J. Hartnup, Mr. A. W. Preston, Mr. R. Sheward, and Mr. W. B. Worthington, B.Sc., M.Inst. C.E., were balloted for and duly elected Fellows of the Society.

The following papers were read :—

(1.) "On the Influence of Forests upon Climate," by Dr. A. Woeikof, Hon.Mem.R.Met.Soc. The first step towards a scientific investigation of the influence of forests upon climate was taken by the establishment of the Bavarian Forest meteorological stations. This example was followed by Germany, France, Switzerland, Italy, and other countries. As a general result it was found that during the warmer season the air and earth temperatures were lower in the forest as compared with contiguous woodless places, that their variations were less, and that the relative humidity was greater. Dr. Woeikof's discussion of this question shows that in the western portions of the Old World extensive forests materially influence the temperature of neighbouring localities, and that the normal increase of temperature from the Atlantic Ocean towards the interior of the continent is not only interrupted by their agency, but they cause the

summer to be cooler in regions situated further in the interior than those nearer the sea. Hence forests exert an influence on climate which does not cease at their borders, but is felt over a greater or less district, according to the size, kind, or position of the forests. From this it naturally follows that man, by clearing the forests in one place and planting others in another, may considerably affect the climate.

(2.) "Report on the Phenological Observations for 1885," by the Rev. T. A. Preston, M.A., F.R.Met.Soc. The year has been a very dry one, and this has acted in such a manner on vegetation that although the winter was mild, plants were very late in flowering and lasted only a short time. The bloom was often profuse, and as bees and other insects could visit it, the crop of fruit was un-unusually great; the apples, for instance, were often of bad quality owing to the enormous number on the trees; whilst in the case of wild fruits, the brilliant colour of the bushes when in fruit was quite as beautiful as when in bloom. But at the same time the drought acted very prejudicially, especially to root crops and bush fruit, as well as to strawberries. In the case of the root crops, the seed had great difficulty in germinating, and the weak plants were at once overpowered by insect pests, so that the crops of turnips were generally complete failures. The insect pests also did much damage to bush fruit, while the drought prevented the strawberries from swelling. The corn did not suffer to any great extent, the dry season allowing the land to be prepared; and although the straw was often short, the yield was not unsatisfactory. A general absence of butterflies was noticed in some places. In the south of England the white butterflies were at one time most abundant, but the autumn butterflies were not so plentiful as usual.

(3.) "Etudes sur les crépuscules rosées," by Prof. A. Ricco of Palermo.

(4.) "The Storm of October 15th, 1885 at Partenkirchen, Bavaria," by Col. M. F. Ward, F.R.Met.Soc. This was the most destructive storm which has occurred in this valley since the winter of 1821-22. The storm burst suddenly at 7 p.m., and lasted about half-an-hour, but in that short period nearly every house was unroofed, and it is computed that in one forest alone above 250,000 trees were laid prostrate.

THE BIELA METEORS.

We regret that a perfectly formed χ (chi) in Col. Ward's letter (p. 163) was misprinted as γ (gamma), and that we failed to notice it when reading the proof. The meteors were expected to radiate from γ Andromedæ; the observed radiant was by some observers stated to be an area of some extent, by others, as by Col. Ward, it was defined as near an individual star, in his case χ *not* γ Andromedæ.